

# A new small computer that won't limit you tomorrow



New Cromemco System One shown with our high-capability terminal and printer.



**Expandability** 

Here's a low-priced computer that won't run out of memory capacity or expandability halfway through your project.

Typically, computer usage tends to grow, requiring more capability, more memory, more storage. Without a lot of capability and expandability, your computer can be obsolete from the start.

The new System One is a real building-block machine. It has capability and expandability by the carload.

Look at these features:

- **Z80-A processor**
- 64K of RAM
- 780K of disk storage
- CRT and printer interfaces
- Eight S-100 card slots, allowing expansion with
  - color graphics
  - additional memory
  - additional interfaces for telecommunications, data acquisition, etc.
- Small size

#### **GENEROUS DISK STORAGE**

The 780K of disk storage in the System One Model CS-1 is much greater than what is typically available in small computers. But here, too, you have a choice since a second version, Model CS-1H, has a 5" Winchester drive that gives you 5 megabytes of disk storage.

#### MULTI-USER, MULTI-TASKING CAPABILITY

Believe it or not, this new computer even offers multi-user capability when used with our advanced CROMIX\* operating system option. Not only does this outstanding O/S support multiple users on this computer but does so with powerful features like multi-

ple directories, file protection and record level lock. CROMIX lets you run multiple jobs as well.

In addition to our highly-acclaimed CROMIX, there is our CDOS\*. This is an enhanced CP/M<sup>†</sup> type system designed for single-user applications. CP/M and a wealth of CP/M-compatible software are also available for the new System One through third-party vendors.

#### COLOR GRAPHICS/WORD PROCESSING

This small computer even gives you the option of outstanding high-resolution color graphics with our Model SDI interface and two-port RAM cards.

Then there's our tremendously wide range of Cromemco software including packages for word processing, business, and much more, all usable with the new System One.

#### ANTI-OBSOLESCENCE/LOW-PRICED

As you can see, the new One offers you a lot of performance. It's obviously designed with anti-obsolescence in mind.

What's more, it's priced at only \$3,995. That's considerably less than many machines with much less capability. And it's not that much more than many machines that have little or nothing in the way of expandability.

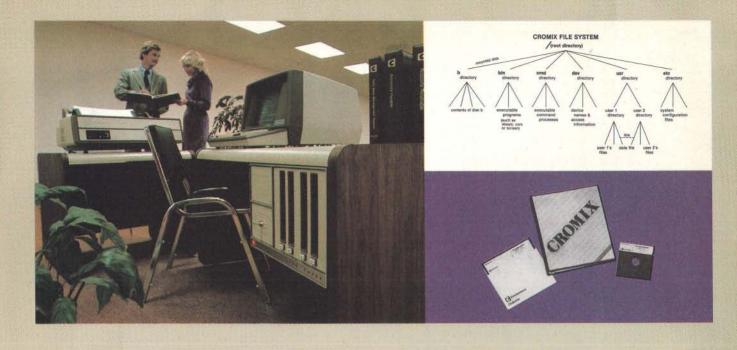
Physically, the One is small — 7" high. And it's allmetal in construction. It's only 141/8" wide, ideal for desk top use. A rack mount option is also available.

#### CONTACT YOUR REP NOW

Get all the details on this important building-block computer. Get in touch with your Cromemco rep now. He'll show you how the new System One can grow with your task.

\*CROMIX and CDOS are trademarks of Cromemco Inc. †CP/M is a trademark of Digital Research





# CROMIX\*— Cromemco's outstanding UNIX†—like operating system

CROMIX is just the kind of major development you've come to expect from Cromemco. After all, we're already well-known for the most respected software in the microcomputer field.

And now we've come up with the industry's first UNIX-lookalike for microcomputers. It's a tried and proven operating system. It's available on both 5" and 8" diskettes for Cromemco systems with 128K or more of memory.

Here are just some of the features you get in this powerful Cromemco system:

- Multi-user and multi-tasking capability
- · Hierarchical directories
- Completely compatible file, device, and interprocess I/O
- Extensive subsystem support

#### **FILE SYSTEM**

One of the important features of our CROMIX is its file system comprised of hierarchical directories. It's a tree structure of three types of files: data files,

\*CROMIX is a trademark of Cromemco, Inc. +UNIX is a trademark of Bell Telephone Laboratories directories, and device files. File, device, and interprocess I/O are compatible among these file types (input and output may be redirected interchangeably from and to any source or destination).

The tree structure allows different directories to be maintained for different users or functions with no chance of conflict.

#### PROTECTED FILES

Because of the hierarchical structure of the file system, CROMIX maintains separate ownership of every file and directory. All files can thus be protected from access by other users of the system. In fact, each file is protected by four separate access privileges in each of the three user categories.

#### TREMENDOUS ADDRESS SPACE, FAST ACCESS

The flexible file system and generalized disk structure of CROMIX give a disk address space in excess of one gigabyte per volume — file size is limited only by available disk capacity.

Speed of access to disk files has also been optimized. Average access speeds far surpass any yet implemented on microcomputers.

#### 'C' COMPILER AVAILABLE, TOO

Cromemco offers a wide range of languages that operate under CROMIX. These include a high-level command process language and extensive subsystem support such as COBOL, FORTRAN IV, RATFOR, LISP, and 32K and 16K BASICS.

There is even our highly-acclaimed 'C' compiler which allows a programmer fingertip access to CROMIX system calls.

### THE STANDARD O-S FOR THE FUTURE

The power and breadth of its features make CROMIX the standard for the next generation of microcomputer operating systems.

And yet it is available for a surprisingly low \$595.

The thing to do is to get all this capability working for you now. Get in touch with your Cromemco rep today.



Cromemco

280 BERNARDO AVE., MOUNTAIN VIEW, CA 94040 • (415) 964-7400 Tomorrow's computers today

Circle 407 on inquiry and

#### **Features**

34 Everyone Can Know the Real Time by Steve

Ciarcia / Technological advances have made real-time clocks simple and inexpensive.

**60** SIx Personal Computers from Japan by Christopher P. Kocher and Michael Keith / A comparative review of the BMC if800, Canon CX-1, Hitachi MB-6890, NEC PC-8001A, Fujitsu FM-8, and Systems Formulate Corporation Bubcom80.

**106** Japan Update by Mark Haas I The semiannual Consumer Electronics Show is on its way to becoming a showcase for new computer products.

114 The Machines Behind the Machines by Phil

Lemmons / Several Japanese companies, both large and small, have their eyes on the American market.

**118** The Japanese Manufacturers—How Successful WIII They Be? by Tod Zipnick / How they fare depends largely on their ability to meet the needs of the American marketplace.

**140** Japan Maps Computer Domination by Tom Manuel / Ten-year R&D effort aims to leapfrog U.S. technology.

**148** The Atari Tutorial, Part 9: Even More Colorsi by Kathleen Pitta and Lane Winner / Television artifacts and the new GTIA chip allow even more colors to be displayed on Atari computers.

**162** Ports of Entry and Soft Breezes for the Color Computer and Model III by William Barden Jr. I A \$10 anemometer and other remote-sensing projects using the cassette interface.

**202** The Input/Output Primer, Part 4: The BCD and Serial Interfaces by Steve Leibson / A look at one of the least understood interfaces—the RS-232C—and one of the first instrument interfaces.

**226** The User's Column: Supercalc, Spelling Programs, BASIC Compilers, and Home-Grown Accounting by Jerry Pournelle / A critical computer user surveys new programs, including one of his own

**274 More Maze Building** by Thomas Edward Neldner / A Pascal program to generate mazes efficiently on a printer.

**318** TRS-80 BASIC Program Hang-ups: The Reasons and Some Solutions by Glenn Tesler / Understand and eliminate those mysterious crashes on your TRS-80 Model I.

**334** Anatomy and Development of a Batch-Processing System by Gene Walters *I* A software system that lets your computer run a series of programs without your intervention.

**426** CHEDIT: A Graphics-Character Editor by Jerry N. Sweet / Define your own character set for Apple Pascal.

**446** Give Your Apple a Voice: A Speech-Development System Using the Radio Shack Speech Synthesizer by John Blankenship / How to make your Apple II talk.

**465** Programming PERT in BASIC by Steven Zimmerman and Leo M. Conrad / A method for planning complex activities where no precedents exist.

**479** CP/M, Your Time Has Come: A Real-Time Clock for the Most Popular Microcomputer Operating System by J. L. Calaway and B. Hill I All the hardware and software you need to get time-of-day printouts whenever you like.

#### Reviews

224 Alien Typhoon by Walt Latocha

246 PLII for Microcomputers by John A. Lehman

**252** Apple II 80-Column Video Boards, Five Popular Units by John E. Howland

266 More Apple 80-Column Boards by Gregg Williams

**286** Colne Robotics Armdroid, The Small-Systems Robot by Steven W. Leininger

296 Super FORTH Isn't by Gregg Williams

#### Nucleus

6 Editorial: Japan and the "64K" Question

14 Letters

20, 307 BYTE'S Bits

22 BYTE Comment: Copyrights, Computers, and the Betamax Case 300, 302, 304 Book Reviews: Fifty BASIC Exercises; Programmer's

Guide to the 1802; TRS-80 Color Computer Technical Reference Manual

300 BYTE's Bugs

308 Programming Quickies: Structured Strings in BASIC

388 BYTELINES

398 Ask BYTE

408 Event Queue

457 Technical Forum: Hierarchical Interrupts

460 Books Received

462 Clubs and Newsletters

463 Software Received

494 What's New?

542 BOMB, BOMB Results

542 Unclassified Ads

543 Reader Service



Page 60



Page 106



Page 114



Page 286



#### Editor in Chief

#### Christopher Morgan

#### Managing Editor

Mark Haas

#### Technical Editors

Gregg Williams, Senior Editor; Richard S. Shuford; Curtis P. Feigel; George Stewart: Arthur Little: Stanley Wszola; Steve Ciarcia; Mark Dahmke Philip Lemmons; Allan Lundell, Consulting Editors; Jon Swanson, Drafting Editor

#### Copy Editors

Beverly Cronin, Chief; Faith Hanson; Warren Williamson; Anthony J. Lockwood; Ann Graves; Hilary Selby Polk; Elizabeth Kepner; Margaret Cook, Junior Copy Editor

#### Assistants

Faith Ferry; Debe Wheeler; Beverly Jackson

#### Production

David R. Anderson, Assoc. Director; Patrice Scribner; Damian Henriques; Jan Muller: Virginia Reardon: Sherry McCarthy, Chief Typographer; Debi Fredericks; Donna Sweeney; Valerie Horn; Jonathan M. Graves, Creative Consultant

#### Advertising

Thomas Harvey, Director; Marion Carlson; Rob Hannings: Deborah Porter: Vicki Reynolds; Cathy A. R. Drew; Jacqueline Earnshaw, Reader Service Coordinator; Wai Chiu Li, Advertising/ Production Coordinator; Linda J. Sweeney

#### Circulation

Gregory Spitzfaden, Manager; Andrew Jackson, Asst. Manager; Agnes E. Perry: Barbara Varnum; Louise Menegus; Pinky Krulis; Sheila A. Bamford James Bingham, Dealer Sales; Deborah J. Cadwell, Asst. Linda Ryan

#### Controller's Office

Daniel Rodrigues, Controller; Mary E. Fluhr, Acct. & D/P Mgr.; Karen Burgess; Jeanne Cilley; Linda Fluhr; Vicki Bennett

#### Traffic

N. Scott Gagnon; Scott Jackson, Kathleen Reckart

#### Receptionist

Jeanann Waters

#### **Publishers**

Virginia Londoner; Gordon R. Williamson; John E. Hayes, Associate Publisher; Cheryl A. Hurd; Michele P. Verville, Publisher's Assistants:

Officers of McGraw-Hill Publications Company: Paul F. McPherson, President; Executive Vice Presidents: Daniel A. McMillan, Ill, Gene W. Simpson; Senior Vice President-Editorial: Ralph R. Schulz; Vice Presidents: Kemp Anderson, Business Systems Development; Harry L. Brown, Special Markets; Robert B. Doll, Circulation; James E. Hackett, Controller; Eric B. Herr, Planning and Development; H. John Sweger, Jr., Marketing.

Officers of the Corporation: Harold W.

McGraw Jr., Chairman and Chief Executive Officer; Joseph L. Dionne, President and Chief Operating Officer; Robert N. Landes, Senior Vice President and Secretary; Ralph J. Webb,

Treasurer.



### In This Issue

The Japanese entered the American personal computer market in earnest this year, and as one might expect, their products come standard with a host of "extras" at a price competitive with current American designs. This month we look closely at several Japanese personal computers—some that are already on the market, some that are on the horizon, and some that may never be sold in this country. Six machines, from Hitachi, BMC (Oki), Fujitsu, Canon, Systems Formulate, and NEC, are featured on the cover (photographed by Paul Avis; Pauline Elkin, stylist). For reviews of these computers see "Six Personal Computers from Japan" by Christopher P. Kocher and Michael Keith. Phil Lemmons discusses the companies responsible for these computers in "The Machines Behind the Machines." For a brief introduction to three new Japanese computers that were shown at the recent Consumer Electronics Show in Las Vegas see "Japan Update" by Mark Haas.

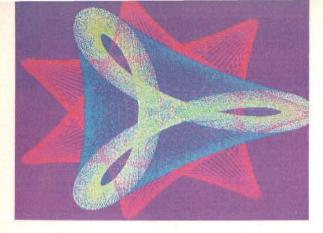
Steve Ciarcia tells you how you can build a real-time clock simply and inexpensively. Steve Leibson continues the Input/Output Primer with Part 4, in which he describes BCD and serial interfaces. Part 9 of the Atari Tutorial is on colors, and William Barden Jr. talks about ports of entry for the Color Computer and Model III.

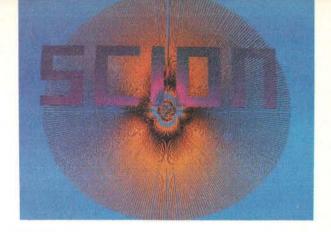
BYTE is published monthly by BYTE Publications Inc, 70 Main St, Peterborough NH 03458, phone (603) 924-9281, a wholly-owned subsidiary of McGraw-Hill, Inc. Address subscriptions, change of address, USPS Form 3579, and fulfillment questions to BYTE Subscriptions, POB 590, Martinsville NJ 08836. Second class postage paid at Waseca, Minnesota 56093 - USPS Publication No. 528890 (ISSN 0360-5280). Canadian second class registration number 9321. Subscriptions are \$19 for one year, \$34 for two years, and \$49 for three years in the USA and its possessions. In Canada and Mexico, \$21 for one year, \$38 for two years, \$55 for three years, \$43 for one year air delivery to Europe. \$35 surface delivery elsewhere. Air delivery to selected areas at additional rates upon request. Single copy price is \$2.95 in the USA and its possessions. \$3.50 in Canada and Mexico, \$4.50 in Europe, and \$5.00 elsewhere. Foreign subscriptions and sales should be remitted in United States funds drawn on a US bank. Printed in United States of America.

Address all editorial correspondence to the editor at BYTE, POB 372, Hancock NH 03449. Unacceptable manuscripts will be returned if accompanied by sufficient first class postage. Not responsible for lost manuscripts or photos. Opinions expressed by the authors are not necessarily those of BYTE. Entire contents copyright © 1982 by BYTE Publications Inc. All rights reserved. Where necessary, permission is granted by the copyright owner for libraries and others registered with the Copyright Clearance Center (CCC) to photocopy any article herein for the base fee of \$1.00 per copy of the article or item plus 25 cents per page. Payment should be sent directly to the CCC, 21 Congress St, Salem MA 01970. Copying done for other than personal or internal reference use without the permission of McGraw-Hill is prohibited. Requests for special permission or bulk orders should be addressed to the publisher.

BYTE® is available in microform from University Microfilms International, 300 N Zeeb Rd, Dept PR, Ann Arbor MI 48106 USA or 18 Bedford Row, Dept PR, London WC1R 4EJ England.

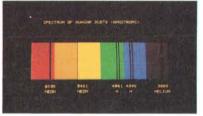
Office hours: Mon-Thur 8:30 AM - 4:30 PM, Friday 8:30 AM - Noon, Eastern Time





"...stands well above other S-100 graphics displays in its price and performance range."

BYTE, Product Review



"...better monochromatic ...display ...." ELECTRONIC DESIGN,

1981 Technology Forecast

# MICROANGELO

HIGH RESOLUTION GRAPHICS SINGLE BOARD COMPUTER 512 x 480 resolution black and white and vivid color displays

RS-170 composite or direct drive output

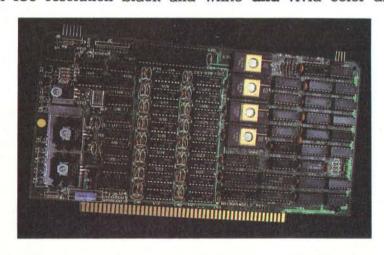
Local or external sync generation

4 Mhz Z80 microprocessor

60 hertz realtime clock

8 level interrupt tie-in

IEEE S100 bus compatible



Light pen interface

Time multiplexed refresh 4K resident Screenware<sup>TM</sup> Pak I operating system

32K RAM

isolated from host address space High speed communications over parallel bus ports

#### Screenware™ Pak I

A 4K byte operating system resident in PROM on MicroAngelo™. Pak I emulates an 85 character by 40 line graphics terminal and provides over 40 graphics commands. Provisions exist for user defined character sets and directly callable user extensions to Screenware™ Pak I.

#### Screenware™ Pak II

An optional software superset of Pak I which adds circle generation, polygon flood, programmable split screen for separate graphics and terminal I/O, relative coordinates, faster vector and character plotting, a macro facility, full UCSD Pascal compatibility, and more.

#### And now...COLOR!!

The new MicroAngelo™ Palette board treats from 2 to 8 MicroAngelos as "bit planes" at a full 512 x 480 resolution. Up to 256 colors may be chosen from 16.8 million through the programmable color lookup table. Overlays, bit plane precedence, fade-in, fade-out, gray levels, blinking bit plane, and a highly visual color editor are standard.

Ask about our multibus and RS-232 versions.



Circle 370 on inquiry card.

12310 Pinecrest Road • Reston, VA 22091 • (703) 476-6100 • TWX: 710-833-0684

syn · op · sis, n. 1. a brief compendium of comments giving an overview of the whole subject.

a central index to the CP/M files on all your disks.

#### YOUR FILE CONTENTS AT A GLANCE!

SOFTWARE.LET
/DISK#23
1 January 1982
Ellen J. Potter: pb
Digital Marketing Corp.
Order for Synopsis

SYNOPSIS<sup>11</sup> automatically maintains a central Index with the file name, disk I.D., plus four user-defined lines of comments about any CP/M file, (i.e. date, writer, addressee, and subject.)

When editing a document file, just enter the four lines as non-printing comments at the top of your text. SYNOPSIS automatically reads the comments into the index. Nondocument files can also be cataloged in the index.

You can search the index for words or phrases in one or more fields. SYNOPSIS displays each full entry found.

The price is \$125. SYNOPSIS requires CP/M 2.x or MP/M, WordStar, Spellbinder or Magic Wand and 48K RAM. Formats: 8", NorthStar DD, Micropolis Mod II, Superbrain 3.0, Apple II with CP/M, 51/4" Xerox and 8" Xerox.



#### DIGITAL MARKETING CORPORATION

2670 CHERRY LANE • WALNUT CREEK • CA • 94596 (415) 938-2880 • Telex 17-1852 (DIGMKTG WNCK) Dealer Inquiries Invited

A Product Of PRO/TEM

Trademarks: Synopsis - Pro/Tem Software, CP/M, MP/M -Digital Research, WordStar - MicroPro Intt. Spettbinder -Lexisoft: Magic Wand - Peachtree Software

### **Editorial**

# Japan and the "64K" Question

by Chris Morgan, Editor in Chief

Last May, Senior Editor Gregg Williams and I went to Tokyo to prepare for this special issue featuring the new Japanese personal computers. "Will the Japanese take over?" we asked ourselves during our ten-day whirlwind tour of major Japanese electronics firms. That was the 64K question. The answer is "There is no answer."

One can draw parallels to other consumer markets in which the Japanese have become dominant, but those comparisons would be risky. For one, U.S. companies offered no real competition to the Japanese when the latter swept in to blitz the car, camera, and audio markets. But the situation is fundamentally different in the computer field. The vast majority of technical computer innovations have come from American research-and-development labs—till today, at least. But now the Japanese are aggressively entering the R&D field. Therein lies the danger (or the opportunity, depending on your point of view).

The question of whether the Japanese will take over or not is, in a sense, moot. By one definition they already have. Lift the lid on almost any personal computer and you'll see scores of Japanese-made components: resistors, capacitors, and ICs (especially memories, a field where the Japanese dominate the world market). Often a majority of the components are made in Japan. Yet in another sense the Japanese must fight an uphill battle against the creativity of American computer companies.

The other big "if" in the picture is the U.S. government's position on Japanese imports in general. The Japanese are all too aware that a major change in import duties or quotas could quickly cut them off from the world's most lucrative consumer-electronics and computer market.

What will their strategy be? I see a two-pronged approach: (1) form joint ventures with American companies so the Japanese will have access to the U.S.'s vaunted software experience, and (2) complete the development of the recently announced "Japanese master plan for a fifth-generation computer system" with a massive R&D push. I'll describe both approaches in detail. First, the joint-venture strategy.

#### Japanese-American Joint Ventures

The Japanese are weakest in software development; their track record has been uneven. They've developed some of the best video-game software in the business (e.g., Space Invaders and Pac-Man), but their business software has been virtually nonexistent. One reason for this is the radically different way the Japanese conduct business, a direct function, in turn, of the complexity of written Japanese. The Japanese use three different character sets containing a myriad of symbols. A conventionally designed Japanese typewriter would be almost a contradiction in terms. To my knowledge there are no typewriters

# PERGOM

YOU GET MORE OUT OF PERCOM DISK SYSTEMS.

EXPECT IT!

H/Z-89, IBM PC and TRS-80\* Model III. Prices start at under \$3000.
Options: 5- or 14- Mbyte drives, floppy disk controller.

At Percom, our business is making disk storage systems for microcomputers—something we've been doing right, since 1977.

From the design of rock-solid drive controller circuitry to quality controls that include 100% life testing of every drive shipped, you can expect to get more out of Percom Disk Systems.

And Percom provides you with comprehensive after-sales service from our wholly owned, fully independent customer service center.



#### WINCHESTER 10-MEGABYTE DISK STORAGE SYSTEMS

Enormous storage capacity plus high speed. Percom 5¼ inch hard disk systems are 40 times faster than single-density floppy mini-disks, 20 times faster than doubledensity units.

Systems include a smart, four-drive controller featuring state-of-the-art data encoding and separation, adaptable industry-standard disk interfacing. Versions for the Apple II, Atari,



THE DRIVE PEOPLE

11220 Pagemill Road • Dallas TX • 75243 • (214) 340-7081



40 or 80-track drives, single or dual-head, flippy or non-flippy — all double-density rated. Available in 1, 2 and 3-drive add-on units, 1 and 2-drive internal units, with full documentation and software support.

Add-on drives from \$399, complete systems from \$459.95.

To learn more about quality Percom disk storage systems, mail the coupon today. Or, call toll-free 1-800-527-1222.

YESI'd like to know more about Percom disk systems. Please rush me information. Send to: PERCOM DATA COMPANY, INC. Dept BD1 11220 Pagemill Road, Dallas TX 75243	
name	
street	
city state zip	
phone number	
I'm interested in floppy disk storage for my TRS-80	
I'm interested in hard disk storage for my □ IBM PC □TRS-80 MdI III □ Apple II □ Atari □ H/Z-89	
Other computer? (☐ floppy disk or ☐ hard disk?)	

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

\*TRS-80 is a trademark of Tandy Radio Shack Corporation which has no relationship!to Percom Data Company, Inc.

© 1981 Percom Data Company, Inc.

# SCA EW

#### SYMBOLIC DEBUGGER

This fourth generation version of our reliable, Z-80 native code compiler adds the two features professionals ask for:

- ♦ InterPest<sup>TM</sup>—an interactive symbolic Pascal debugger that allows easy error detection.
- ◆ Overlays—that allow larger programs to run in limited memory.

#### A compiler for Professional programmers

Pascal/Z is a true Pascal. It closely follows the Jensen and Wirth standard with a minimum of extensions designed to aid the serious program developer in producing extremely compact, bug-free code that runs FAST.

Pascal/Z generates Z-80 native code that is ROMable and Re-entrant. Permits separate compilation, direct file access, external routines and includes a relocating macro assembler and Microsoft compatible linker. And code written for Pascal/Z is fully compatible with I-PAS 8000, our new native code Pascal compiler for Z-8000, to guarantee graceful migration to 16 bit operation.

#### Get "The FACTS about Pascal"

Confused about which Pascal to buy? Pseudo-code... Native code... M, MT or Z? Compare the unbiased benchmarks in our new booklet. Don't buy a Pascal compiler until you've read it.

> Call us for a free copy: 800-847-2088 (outside NYS)

> > or 607-257-0190

And ask your local full-service computer dealer about our Pascal/Z demo package.



#### Micros for bigger ideas.

Ithaca Intersystems Inc.

1650 Hanshaw Rd • Ithaca, NY 14850 • TWX 510 255-4346 U.K. Distributor:

Ithaca Intersystems (U.K.)Ltd. Teles 200560

#### Editorial.

that can type Japanese characters. (Significant progress is being made, however, in the display of Japanese characters on video screens. At last year's Tokyo Microcomputer Show, several computer terminals were shown for the first time displaying all three Japanese character sets: kanji, katakana, and hiragana.) Japanese secretaries write all business correspondence—what there is of it-in longhand because most negotiations are conducted verbally. As a result, the Japanese lack an intuitive understanding of American office procedures and are hampered in their ability to design good wordprocessing software.

To remedy this situation, many Japanese computer companies are obtaining licenses from U.S. companies to use software such as CP/M, Microsoft BASIC, and Visicalc on Japanese computers, and they are forming joint ventures with American companies, such as the Fujitsu/TRW connection. This type of alliance helps cloud the issue of import restrictions, because the U.S. companies could rightly claim that actions against a Japanese partner would hurt the American partner too. Japanese companies are also building, or planning to build, production plants in America. Japanese electronics companies are sometimes more adventuresome than their American counterparts. In the videodisc field (which we'll be covering in detail next month), despite IBM's and MCA's withdrawal from the laserdisc market, Pioneer is planning to build an American videodisc production plant. Pioneer deserves high praise for backing the best videodisc format and not letting it die. It's unfortunate that RCA and Sears are continuing to promote the inferior Selectavision system.

#### The "Master Plan"

Circle 219 on inquiry card.

Of potentially greatest significance in Japan's computer fortunes is the ten-year plan for national computer policy announced last fall by the Japanese Information Processing Development Center (JIPDEC), whereby Japanese computer companies would jointly develop a grandiose fifth-generation computer system on several different levels, relying on sophisticated artificial-intelligence research into natural languages and graphics. (See Tom Manuel's article, "Japan Maps Computer Domination," page 140.) This may sound like a major threat, but as Tod Zipnick says (page 118), in many cases Japanese computers are designed for the Japanese market. One of the biggest technological problems the Japanese face today is that their written language is virtually unusable for fostering computer literacy. (All the Japanese software we saw was written mostly in BASIC with Japanese REM statements. The REM statements were written in a phonetic, Roman form of kanji that the Japanese use with some reluctance because it is considered aesthetically inferior to true kanji. Quite simply, there is no practical alternative if the Japanese wish to do any meaningful programming. The fact is that every high-level language

# Ithaca 525/800<sup>™</sup>

A computer system so advanced, the technology you'll need later is already here. And waiting.



The Ithaca 525/800 gives you the ability to address an almost unlimited number of applications in business scientific and educational environments

business, scientific, and educational environments. Its state-of-the-art hardware gives you a single or multi-user 8-bit system in one machine that handles 51/4" or 8" floppy and hard disks.

It has a processor that's 50% faster than conventional systems. A unique Cache CP/M° - MP/M° system that's typically 500% faster. That's right, 500%. And up to 1 Mbyte of memory.

It has add-on capacity built-in now, ready to expand when you're ready. There are no hidden costs to pay for later. Everything you need comes with the Ithaca 525/800. In fact, it could be the only system you'll ever need.

It's simply the finest price/performance Z-80® based system available. And it's here now, waiting for your call.

#### 800-247-2088

In New York State (607) 257-0190

# Dooter Systems

We think as fast as you do.

1650 Hanshaw Road, P.O. Box 91 Ithaca, NY 14850 TWX: 510-255-4346 presently in existence uses some form of the Englishbased ASCII character set.) And the Japanese (like the Chinese, who face a similar problem) must become as computer-literate as the rest of the world to survive in the coming computer age. Their preoccupation with overcoming the computer-language barrier will necessarily temper their aggressive ways for a while. Nonetheless, I have a great deal of respect for their ability to get up to speed quickly.

I welcome the Japanese into the "international computer sweepstakes." Only when we begin to think on a more global than national scale will we see that the socalled "Japanese threat" is really more of an "international promise."

#### A Note About Our Hardware Reviewers

This month we review six Japanese computers in "Six Personal Computers from Japan" (page 60) cowritten by Michael Keith and Christopher Kocher. Both men work in advanced computer science research in the southern New Jersey area and wrote the NEC PC-8001 review that appeared in the January 1981 BYTE (page 72). Producing these six comprehensive reviews was a major undertaking, and we thought BYTE readers would enjoy learning a little bit about their backgrounds.







Chris Kocher

Michael Keith is 26 years old and has a BS degree in electrical engineering from the New Jersey Institute of Technology and an MS in electrical engineering from Stanford University. He owns an Apple II computer. Among other things, he uses it in his spare time to manage the finances of his church. His other pursuits include playing the piano, reading, and juggling.

Thirty-four-year-old Chris Kocher has a BA in chemistry and an MS in systems engineering, both from the University of Pennsylvania. He is, in his own words, "slowly making my way toward a PhD in systems engineering." His hobbies include collecting books (over 2000 so far) and cross-country skiing.

# CompuView

# CP/M-86 For PERSONAL COMPUTER

The first available implementation of CP/M-86 for the IBM Personal Computer has the features needed to run the full range of CP/M-86 application programs. Included are serial and parallel printer support, a 'smart' screen driver which can emulate most popular CRT terminals, and double density 193K/drive disk capacity. The Tecmar, Inc. Winchester hard disk & other peripherals are also

Innovative features include built in horizontal scrolling and screen line editing which lets the user extensively edit or re-enter any line on the screen for CP/M and application programs. Besides editing the line being typed in, the cursor may be moved to any line on the screen, and the line edited by overtyping or inserting and deleting characters. Typing the 'Return' key will then send the line, as it appears on the screen, to CP/M. While common on mainframe systems, this screen line editing is new to CP/M and greatly reduces the amount of retyping necessary due to mistyped or repeated commands.

CompuView CP/M-86 for IBM Personal Computer. . . \$325 VEDIT-86 with above purchase. . . . . . . . . . . \$100

### 8086 Software

- VEDIT full screen editor for CP/M-86, SCP 86-DOS, IBM Personal Computer and IBM Displaywriter. Disk and
- CP/M-86 BIOS for popular S-100 disk controllers and SCP 8086 computer. Source Code . . . . . . . . . . . \$90

### V-COM Disassembler

Finally a Z-80 disassembler for CP/M which produces easy to read code, a cross reference table and handles INTEL and ZILOG mnemonics. V-COM is exceptionally fast and produces an .ASM file directly from a .COM file. V-COM can accept two user created information files. One contains assignments of labels to 8 and 16 bit values; the second specifies the location of tables and ASCII strings. The resulting .ASM file will then contain labels and proper storage allocation for tables and strings. Each information file may contain nested 'INCLUDE' to other files. Each package includes a 30 page manual, sample program files and variations of V-COM compatible with the TDL, MAC 



### Uniquely User Oriented

VEDIT is user oriented to make your editing for program development and word processing as fast and easy as possible. The customization (installation) process makes VEDIT the only editing package that allows you to determine your own keyboard layout and use any available cursor and function keys. Just think of the difference it makes in your ease of learning and usage to type cursor and function keys instead of memorizing obscure control characters. This customization is menu driven, extends to much more and takes only a few minutes.

### Unequaled Hardware Support

The CRT version directly supports over 35 terminals (including ANSI standard) in its installation menu and utilizes 'smart' terminal features such as line insert/delete. reverse scroll, status line and reverse video. Function keys on terminals like the Televideo 920/950, Heath H19, and IBM 3101 are all supported. The memory mapped version is extremely flexible, supports bank select such as on the SSM VB3 and screen sizes up to 70 X 200.

### Sophisticated Full Screen Editing

VEDIT gives you true 'what you see is what you get' full screen editing with an extensive set of features for creating and editing standard text files of up to one diskette in length. Very large files are effortlessly handled by VEDIT's ability to edit up to 47K of a file entirely in memory without performing any slow and annoying disk accessing. And you can handle multiple files, insert a specified line range of another file anywhere in the text and even change diskettes.

### User Oriented **Features**

You get the features you expect, like searching, a scratchpad buffer for moving and rearranging sections of text, complete file handling on multiple drives and flexible macros. For ease of use VEDIT has features you won't find elsewhere, like automatic indenting for use with structured languages such as Pascal and PL/I. You are less likely to make a mistake with VEDIT, but if you do, one key will 'Undo' the changes you just made to a screen line. And if you run out of disk space with VEDIT, you can easily recover by deleting old files or even inserting another diskette. It is therefore no surprise that VEDIT is the industry standard for program development editing.

### Word Processing

VEDIT is suitable for simple stand-alone word processing, or it may be used in conjunction with a text processor. Its features include word wrap, adjustable left margin, reformatting of paragraphs, word oriented cursor movement and deleting, and imbedding of printer control characters. VEDIT can print any portion of your file and display the cursor's line and column positions.

Now for **IBM** Personal Computer XEROX 820

### Ordering

Please specify your microcomputer, video board or the CRT terminal version, the 8080, Z80 or 8086 code version and disk format.

VEDIT - Disk and manual For 8080 or Z80 . . . . . . . . \$145 For CP/M-86 or IBM MDOS . \$195 Manual only . . . . . . . . . . . . \$15

VISA and MASTER CARD Welcome.

Apple II Softcard • TRS-80 II and I SuperBrain • Heath H8/H89 • Altos NorthStar • Vector • MP/M • IBM

> 1955 Pauline Blvd., Suite 200 Ann Arbor, Michigan 48103 (313) 996-1299



# CHECK YOUR WAILBUX



# THE NEW CATALOG IS HERE! THE NEW CATALOG IS HERE!



# ISCOUNT COUPON

rom Our SPRING 1982 ENGINEERING SELECTION GUIDE

Appropriate Box



	\$100		\$149.99				*	Deduct \$10.00
	\$150	-	\$199.99					Deduct \$15.00
	\$200	-	\$299.99					Deduct \$20.00
	\$300		\$399.99					Deduct \$30.00
П	\$400		\$499 99					Deduct \$40.00

☐ \$500 & UP .. Deduct \$ 10%

id on Prepaid U.S. Mail Orders Received Before June 15, 1982 \*Sorry, Discount Coupon Not Valid on Shipping Charges, Phone

### Letters

#### **IBM's Personal Computer**

I am in love! After spending considerable time at the local IBM Product Center and reading many highly favorable articles on the IBM Personal Computer, I have concluded that it is the best personal computer on the market today.

I especially enjoyed Gregg Williams's "A Closer Look at the IBM Personal Computer" (January 1982 BYTE, page 36). This was the most complete and detailed article I have seen on the Personal Computer. However, I am confused about one point: does the BIOS (basic input/output system) reside in ROM (read-only memory) or in the DOS? From other sources, I have heard that it occupies 6K bytes of ROM, along with BASIC and the power-on self-test software; Mr. Williams contends that it is in the DOS. Who's right?

Thank you for a terrific article in a terrific magazine!

Arthur A. Glecker 2726 Saint Paul St. Baltimore, MD 21218

In a long article, pieces of information do not always get grouped in the best possible way. Although the section on the IBM BIOS does not say that the BIOS is in ROM, the last line of table 6 (page 54) does give this information. Thanks for your interest in my article. . . . G. W.

I enjoyed "A Closer Look at the IBM Personal Computer." It was the first review I've read that contained nontrivial information. I learned things I didn't know even though I've read most of the manuals and have played with the computer to some extent.

On the negative side, I think your benchmarks were not quite fair to the IBM Personal Computer BASIC. Unlike most other BASICs, IBM's BASIC allows the use of integer variables in FOR statements. Since most FOR loops are over integers anyway, it certainly makes sense to use an integer variable index if it is available. In the benchmarks this could be accomplished by changing the Is to I%s or by using DEFINT I to declare I as an integer variable. If you try it, I think you'll

find that it knocks 2+ seconds off each of the IBM PC times.

Jim Mehl POB 632 Los Gatos, CA 95030

Thank you for your kind words about my article on the IBM Personal Computer. However, I must reiterate a point that seems to be forgotten by many BYTE readers: that a benchmark gains its validity by executing, as much as is possible, the same program on different machines. Integer variables are nothing new; several other Microsoft BASICs have integer variables (e.g., Apple II Applesoft and Radio Shack's TRS-80 Model III BASIC). When the same program coded with integer variables is run, the relative rankings of the machines should be almost exactly the same-but then, that's another benchmark, isn't it? And since we can't run every possible program on a computer, we run a set of benchmark programs that we have carefully chosen to be representative. We did not use a full set of benchmarks in the IBM article due to time constraints; however, a full set of BASIC benchmarks was used to test the six Japanese computers reviewed in this issue (see page 60). . . . G. W.

Gregg Williams's "A Closer Look at the IBM Personal Computer" was highly informative. It is a worthy successor to Phil Lemmons's article, "The IBM Personal Computer: First Impressions" (October 1981 BYTE, page 26). The comparison between IBM medium resolution (320 pixels per row) and IBM high resolution (640 pixels per row), which is discussed on page 39 and pictured in photo 6, may be unfair. The performance in highresolution mode is probably limited by the resolution of the red-green-blue (RGB) monitor that was used. The RGB color monitor shown in photo 1 appears to be an Amdek Color II, which is advertised to resolve up to 560 pixels per row-80 less than the high-resolution mode of the IBM Color/Graphics Monitor Adapter.

Incidentally, Amdek is now accepting orders for a \$10 adapter that enables its RGB monitor to use the intensity bit car-

ried on pin 6 of the IBM Color/Graphics Monitor Adapter, and thereby to generate 16 colors.

Gary G. Price, Assistant Professor
Department of Curriculum and Instruction
University of Wisconsin—Madison
Teacher Education Building
225 North Mills St.
Madison, WI 53706

Though the monitor we used was not supplied by Amdek, it is functionally identical. Both are produced by Hitachi and are RGB high-resolution monitors. When ordering the intensity bit adapter from Amdek, ask for the 16-Color Modification. Future models of the Amdek Color II will include built-in 16-color capability. Amdek is located at 2420 E. Oakton St., Suite E, Arlington Heights, IL 60005 (312) 364-1180. . . . M. H.

#### **Too Much Praise for IBM?**

BYTE has defined a new era in personal computing—in terms of IBM. No customer experience taken into account, no long-term usage needed to evaluate—the IBM Personal Computer is arriving, therefore nothing else need be said. Let us all dispose of our several hundred thousand IBM imitations, which just coincidentally predate the Personal Computer by some years.

What has IBM learned from its own and others' experience? First and foremost (to quote Chris Morgan's editorial, "Of IBM, Operating Systems, and Rosetta Stones," January 1982 BYTE), "the keyboard alone is one of the best I've seen, though I wish the shift keys were more conventionally placed. (Oh, well.)" Is "Oh, well" the only comment appropriate to the "best keyboard" designed by a company that has produced what may purport to be the standard of office typewriter excellence? BYTE simply passes off a conscious corporate stupidity with an "oh well." Justify it to the typist who uses a typewriter alternately with the new "oh well" standard and hits the wrong keys consistently on both.

How many other facets of this machine have been glossed over in the same manner but without accompanying comment? Are we seeing the new BYTE objectivity? A 16-bit chip operating in 8-bit mode is

# HOW TO USE YOUR EPSON WITHOUT WASTING COMPUTER

Copyright 1991 All rights energed

Copyright 1991 All rights energed

Madd 8171

Your computer is capable of sending data at thousands of characters per second but the Epson can only print 80 characters per second.

This means your computer is forced to wait for the printer to finish one line before it can send the next. A waste of valuable time.

# THE NEW MICROBUFFER™ ACCEPTS DATA AS FAST AS YOUR COMPUTER CAN SEND IT.

Microbuffer stores the data in its own memory buffer and then takes control of the printer. This frees your computer for more productive functions.

#### PARALLEL OR SERIAL.

Microbuffer model MBP-16K is a Centronics-compatible parallel interface with 16,384 bytes of on-board RAM for data buffering.

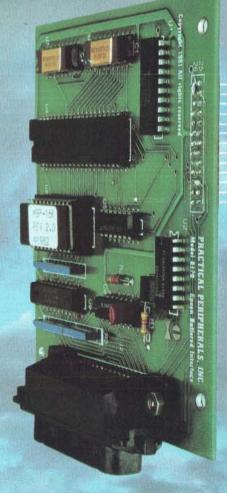
The MBS-8K is a full-featured RS-232C serial interface with both hardware and software (X-On/X-Off) handshaking, baud rates from 300 to 19,000 and an 8,192 byte RAM buffer.

#### SIMPLY PLUG IT IN.

Either model fits the existing auxiliary interface connector inside the Epson MX-80, MX-80 F/T or MX-100 without modification, and is compatible with standard Epson cables and printer control software, including GRAFTRAX-80.

#### JUST \$159.00°

When you think how much time Microbuffer will save, can you afford not to have one? Call us for your nearest dealer.



#### PRACTICAL PERIPHERALS, INC.

31245 LA BAYA DRIVE, WESTLAKE VILLAGE, CA 91362 • (213) 991-8200

Circle 339 on inquiry card.

justifiable because IBM is running at 4.77 MHz (let's have another resounding "oh well" for IBM's high speed).

The reason for all this is to point out, to some of your less sophisticated readers, that for each flaw (if I may use such a four-letter word in conjunction with IBM) there appears to be a BYTE rationale to justify it.

I don't remember, in the history of BYTE, any other company or products being accorded such accolades for a product yet unproven in the field with software, other hardware, and peripherals.

McGraw-Hill owns BYTE. Does IBM own McGraw-Hill?

Jack Kahn 6013 Summerhill Rd. Camp Springs, MD 20748

Oh, well. I'm afraid Mr. Kahn misinterpreted my editorial, or failed to read the January BYTE closely enough. If he had, he would have realized that we discussed the shortcomings of the IBM machine in Gregg Williams's review on pages 60 and 61, including comments about the

machine's speed. To imply that we have been less than forthright in evaluating the IBM Personal Computer is patently unfair. In fact, next month's BYTE contains some fairly strong criticism by Jerry Pournelle about shift-key placement on the IBM, and last month we printed an article about the good and bad humanfactors design points of the machine ("A Human-Factors Case Study Based on the IBM Personal Computer" by Robert G. Cooper Jr., Paul Thain Marston, John Durrett, and Theron Stimmel, page 56). I'm distressed by Mr. Kahn's implication that we are somehow in cahoots with IBM, or that we are withholding our true opinions. We simply stated what we thought about the machine: that it has a very good overall design-period. . . . C. M.



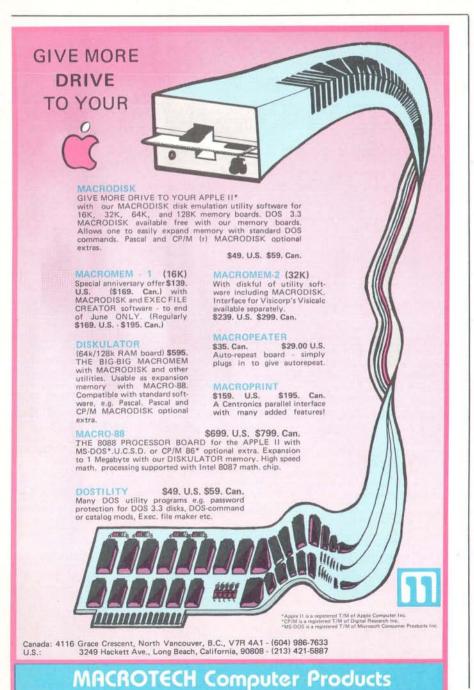
I read with interest the interchange of letters between Intertec's Manager of Public Relations and one of the firm's customers (see "Open Letter to Potential Superbrain Buyers," January 1982 BYTE, page 18).

Significantly, Intertec made no case to justify its warranty policies other than to refer to "rules," that is, their Master Agreement. As an independent consultant to the industry for product-support operations, I advise my clients to accept full responsibility for field failures arising out of component failures following delivery. Realistically, there is no such thing as a shelf life for electronic devices; these devices are not loaves of bread.

This ploy is peculiar to the computer and computer peripheral industry. It is not practiced by responsible and knowledgeable manufacturers of electronic devices in other areas of the industry. It appears to be nothing more or less than a ploy to avoid warranty responsibilities. There is simply no justification for penalizing the ultimate consumer because a product did not move off the shelf within some arbitrary time period established by the manufacturer. Business can be bad—the dealer simply may be unable to move his merchandise as promptly as even he would wish.

Certainly, warranty policies of this nature suggest a lack of confidence on the part of the manufacturer in the reliability of its product over the short haul.

Perhaps if Intertec and other companies employing this practice would establish



# "IBM Personal Computer" USERS YOU DESERVE THE BEST!

choose what the professionals\* use Available now COMBO CARD Includes 1 year warranty!

# Combo Card (User Upgradeable) • MC-064 64K From \$435 • MC-128 128K From \$635 • MC-192 192K From \$835 • MC-256 256K From \$1035

- Suffix S = ASYNC comm. option \$60
  Suffix P = parallel printer option \$60
  Suffix SP = both options \$120
  User upgrade document available for sale, order model MC-001SP
- Program compatible with IBM's

- 64KB-256KB Parity Memory MP-064: \$395 MP-128: \$595 MP-192: \$975 MP-256: \$995
- User upgradeableFully assembled, tested & burned-in
- 1-year warranty

#### **Advanced Communication**

- CC-232: \$295
- 2 RS232 portsCapable of ASYNC, BISYNC, SDLC,

#### **ASYNC Communication**

- CC-032: \$145 CC-132: \$275CC-032 offers 1 serial port
- CC-132 offers 2 ports
- Program compatible with IBM's Serial Com. Card

- Hardware Prototype
   WW-068: \$75 WW-069: \$55
- WW-068 wire wrap card (13" x 4.2")
- WW-069 extender
- Get both for \$95

Our customers include: IBM, TRW, Bell Labs, Visicorp, Softech Microsystems Inc., Information Unlimited Software, Context Management, Network Consulting Inc., etc.



17925 Sky Park Circle, Suite B Irvine, CA 92714 (714) 540-1333 **Dealer Inquiries Welcome** 

aggressive Customer Relations departments concerned with the care of customers, there would be no need of Public Relations departments in their organizations. Undoubtedly, they would experience an increase in sales plus improved relations with their dealers

If the Federal Trade Commission ever took the time to examine this failure to extend warranty coverage to the ultimate consumer, I suspect a "cease and desist" order would be forthcoming.

I suggest that Intertec clean up its act and provide a reasonable level of protection to the guy at the end of the pipeline. He deserves nothing less.

#### R. C. Redpath 250 Ramblewood Parkway Mount Laurel, NJ 08054

The letter to the editor, in the January 1982 BYTE, from James Ford of Paoluccio Willis Nau Associates regarding the purchase of several Superbrains and a subsequent misunderstanding between Mr. Ford and the dealer he purchased the equipment from points out an industrywide problem.

Certainly, one should attempt to purchase equipment at the best possible price; however, it's important to remember that the sale is only the beginning of the relationship between the dealer and the customer. From time to time, equipment does malfunction and must be repaired; advice about communications, protocol, and software is sometimes called for.

Here at Compudial/Tristar, we give a guarantee from the date of purchase on Superbrains and other Intertec equipment and stand behind the product with knowledge of its capabilities and limitations. This is not meant to be a selfcongratulatory statement; rather, it is to point out to our dealers and potential customers that, just as not all Superbrains are perfect when they come off the production line, neither are all dealers.

Simply stated, when one is purchasing any data-processing equipment, one should look for an established. knowledgeable, and reputable source that is capable of servicing the equipment.

Daniel F. Brown, President Compudial Inc. 2 Keystone Ave. Cherry Hill, NJ 08003

#### More on Intertec from the Federal Trade Commission

I read with interest the correspondence relating to the warranty on Intertec's Superbrain computer. Mr. Ford, the computer purchaser, assumed that even if the product was "inoperable when the cartons were first opened [he] would have had to pay repair charges." Intertec does not deny this interpretation of its warranty. Rather, it claims that the "warranty offers [its] customers excellent coverage. . . . Fortunately for purchasers, Mr. Ford's idea of who has to pay may be as incorrect as Intertec's reply is disingenuous.

The law does not require that merchandise be sold with a written warranty. However, whether or not the manufacturer or dealer includes a written warranty, the law of 49 states (under the Uniform Commercial Code) usually implies certain warranties. For example, there is usually an implied warranty of merchantability:

the goods must be fit for the general purposes appropriate to that type of goods. This implied warranty applies at the time of sale regardless of whether the manufacturer's or dealer's warranty has expired. Further, delivery of a defective item may be a total failure of consideration, or breach of contract, by the seller. I suggest that a purchaser of a defective product consult a private attorney if the seller refuses to repair or replace it. Note that this doesn't apply to products sold "as is."

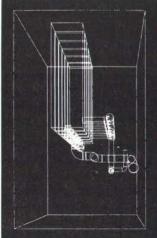
Incidentally, the Federal Trade Commission enforces a law called the Magnuson-Moss Warranty Act. This law sets standards for disclosing the terms of written warranties on consumer (personal) products. Had Mr. Ford purchased a home microcomputer, the company's warranty would have had to state: "This warranty gives you specific legal rights, and you may also have other rights which vary from state to state."

Randall H. Brook Assistant Regional Director Federal Trade Commission Seattle Regional Office 2840 Federal Building 915 Second Ave. Seattle, WA 98174

#### More on Warranties

Isn't it time that our industry grew up? I just resisted purchasing an expensive piece of computer software for which the warranty reads in part:

> All . . . computer programs are distributed on an "as is" basis with-



GRAPHIC SOFTWARE FOR MICROCOMPUTERS — This self-teaching guide will show you how to write your own graphics software. 61 programs for 2D and 3D graphics: interactive input, translations, rotation, isometric views, perspective, scaling, stretching, clipping, surface intersections, shading, hidden line removal, tablet software, animation and more. Applications to science, engineering and business. "One of the most outstanding books on computer software"-A. Grund, U. Illinois; "The best book available on microcomputer graphics" — Creative Computing Feb. 1982. Book - \$21.95; Disk - \$18.95.

# **ENGINEERING**

ENGINEERING SOFTWARE FOR MICROS —A selfteaching guide to developing software for engineering applications of microcomputers. Emphasis is on combining graphics with engineering problem solving. Programs included to interactively create engineering drawings, store on disk file, recall, modify and merge. Other programs for simulation, mechanisms design, heat transfer, circuit analysis, optimizations and including Monte Carlo techniques. Programs for Fourier analysis display frequency spectra graphically. This is a valuable collection of modern engineering analysis software for students and professionals. Book - \$28.50; Disk - \$19.95.

Books contain fully documented program listings in BASIC with theory and equations. Disks contain the same programs as the books but without documentation. When ordering disks, please specify APPLE II Plus 48K DOS 3.3 or CP/M.

out warranty of any kind. The entire risk as to the quality and performance of such programs is with the purchaser. Should the programs prove defective . . . the purchaser and not the manufacturer . . . assumes the entire cost of all necessary servicing or repair. (The company) shall have no liability or responsibility to a purchaser. . . .

This is not mere legal jargon. It's the embodiment of a business philosophy which seriously harms all of us. It encourages sloppy work and inadequate testing, and it increases the potential for dishonesty. Is it any wonder that so many businessmen are turned off by computers?

To software companies I say: Accept responsibility for your products. Get the bugs out *before* you sell them. Don't try to sell a program debugged by your customers as a "revised" or improved product at additional cost.

To software consumers I say: If possible, avoid products for which there is no warranty. Don't buy on faith. Complain loudly to software companies which provide no warranty.

Of BYTE I ask: Speak out on the importance of product and software warranties. Help your readers by reporting on the warranty provided in your product and software reviews, perhaps in your "At a Glance" boxes. Praise the responsible firms that produce quality products and help to expose the ones with a reputation for bugs.

John Navas II 490 Mariners Island Blvd., #108 San Mateo, CA 94404

#### Note Pad for the Handicapped

I think that Howard Batie's article "Handi-Writer, A Video Note Pad for the Physically Handicapped" (December 1981 BYTE, page 474) described the most valuable and original application of a microcomputer that I have seen.

I have worked extensively with the handicapped, including many cerebral palsy victims, and I agree with Mr. Batie's estimate that these people are not generally intellectually deficient. Many feel that they are emotionally unstable, but I have never seen any evidence of instability that was not explainable, to me, by their severe frustration. What a boon it would be for such an imprisoned mind to finally be able to communicate!

I am sure it would not be difficult to add another button to the control panel so that data could be output to a printer, or this could be done by intervention of a companion, when the user is satisfied with the text in the buffer.

Imagine—correspondence and creative writing for those who previously had no means of expression.

Ralph Nottingham 1619 SE 3rd Court Deerfield Beach, FL 33441

#### Software Copyright Kit

I have received an overwhelming number of inquiries concerning the booklet "The Copyright Kit—How to Copyright Your Computer Software," which was mentioned in a letter published in the October 1981 BYTE (see "Legal Arguments," page 10). You must have an incredible readership! Letters and telephone calls poured in from all over the country, as well as from England and Italy.

Please inform your readers that the Copyright Kit is available for \$12.95 (plus \$2 postage and handling) from B. T. Enterprises, 171 Hawkins Rd., Centereach, NY 11720, and from National Attorneys' Publications Inc., POB 150, East Setauket, NY 11733.

Noel D. Adler POB 150 East Setauket, NY 11733

#### **Apathetic Advertisers**

As one of the millions whose relationship with computers has been an adversary one, my interest in them was zilch until I read *The World Challenge* by Jean-Jacques Servan-Schreiber (Simon and Schuster 1981), a book in which the role of computers in the world of tomorrow is rather graphically delineated. The mention of BYTE in the same book led to my subscribing to your publication.

Although I find much of the material in BYTE less than comprehensible, I'm slowly learning about computers and the many possibilities they offer. I've already decided to buy a home computer; unfortunately, many of your advertisers do little to facilitate the process of evaluating their products and services.

For example, I wrote to Apple for brochures and specifications on its various models, accessories, software, etc. In return, the company sent a booklet outlining the development of its Apple

#### STRUCTURAL ANALYSIS SOFTWARE

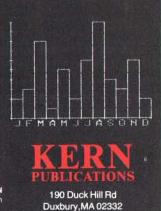
STRUCTURAL ANALYSIS ON MICROS — This self-teaching guide contains a series of programs which calculate stresses and deflections in beams, plates, trusses and frames using conventional and matrix techniques. Theory, equations and program listings fully documented. Written for the non-specialist who wants to use his micro for structural analysis with minimum investment in time. Use the programs as is or modify for your own applications. Book – \$39.95; Disk – \$19.95.

# DATA PLOTTING SOFTWARE

DATA PLOTTING ON MICROS — A collection of programs to process and display all types of data: bar charts, stock market charts, engineering and scientific data, 3D views of surfaces, pie charts, sorting, filtering, running averages, curve fitting, and more. Application to business, engineering and science. All programs fully documented and keyed to theory. Use as is or modify for your own applications.

Book – \$24.95; Disk – \$19.95.

To order, send check drawn on U.S. bank, money order in US funds, Visa or Mastercard number with expiration date to KERN PUBLICATIONS 190 Duck Hill Road, P. O. 1029A, Duxbury, MA 02332. Add \$2 per book 4th cl postage in US and Canada; \$3 1st cl or UPS in US; \$4.50 1st cl Canada; \$12 air Europe and Central America; \$18 elsewhere. Call (617) 934-0445 for faster delivery.



III—but none of the more useful materials I'd requested. I've written Atari twice and telephoned once; many weeks later, Atari has not yet deigned to reply. Of the half-dozen or so computer stores I've written for price lists and information, only one has bothered to reply.

I gather, from the heft of your publication and its numerous advertisements, that there is a rather substantial industry centered around home computers and allied products and services. But I also get the impression nobody's particularly interested in showing any initiative to assist a would-be purchaser in obtaining information that would be helpful in making a reasonably rational buying decision.

H. B. Brandon 1204 Park Lane Clarksdale, MS 38614

### More on a Structured 6809 Assembly Language

Greg Walker's interesting article, "Toward a Structured 6809 Assembly

Language" (November 1981 BYTE, page 370), will be helpful to many people who, for one reason or another, are forced to write in assembly language.

Use of higher-level language control structures in assembly language goes back a long way. In general, there have been two approaches.

The first approach is to write a special assembler which includes high-level control structures as part of the language. The earliest descriptions of this approach with which I'm familiar appeared in Niklaus Wirth's "PL360, A Programmable Language for the 360 Computers" (Journal of the Association for Computing Machinery, 15:1 (1968), pp. 37-74) for a large machine, and Bell and Wichman's "An ALGOL-like Assembly Language for a Small Computer" (Software—Practice and Experience, 1 (1971), pp. 61-72).

This approach can produce comprehensive error messages and more efficient generated code because long/short branches, etc., can be optimized.

The second approach is to implement the control structures via the manufacturer's standard macro-assembler, as in Walker's 6809 macros. The first description of this approach that I know of is M. M. Kessler's \*CONCEPT\* Report 14, Implementation of Macros to Permit Structured Programming in OS/360 (IBM Corporation, Gaithersburg, MD 20760, 1970). The macro approach has the advantage of being piggy-backed on the standard assembler, thus greatly reducing the amount of documentation and programming needed to support it. Also, the macros can be examined easily and altered, if needed, by the user.

When our laboratory implemented Pascal-like control structures for the PDP-11 Macro-11 Assembler several years ago, we discovered that assembler programs with high-level control structures (IF...THEN, DO...WHILE, REPEAT...UNTIL and CASE) were much easier to write, debug, and maintain than the FORTRAN programs we wrote for the PDP-11 (FORTRAN was the only "high-level" language available to us on the PDP-11 at that time).

Scott Herman-Giddens
Department of Computer Science
Duke University
Durham, NC 27706 ■



#### BYTE's Bits

#### Experimental Circuit Package Described

At a recent conference of the International Society for Hybird Electronics, a group of IBM engineers described an experimental circuit package that makes it possible to feed power and information to a complex bipolar logic integrated circuit. The package, with 200 pathways for electrical signals and 16 for power, links thousands of electronic circuits on the chip with the rest of the circuitry in the computer system. The thin metal-film pathways run between 216 connector pins and 354 pads connecting the chip to the package. Previous IBM circuit packages of this nature had a maximum of 96 signal paths and 132 pads, which means that the technique being worked on doubles the signal capacity and nearly triples the number of connection pads.

The chip is the result of an experiment to shrink the size of the IBM System/370's central processing unit to a single integrated circuit measuring one-quarter inch on a side. The System/370 contains nearly 45,000 transistors, resistors, capacitors, and diodes.

312-620-8566

Coming soon! Point of sale software.

897 N.W. Grant Ave. • Corvallis, Oregon 97330 • 503/758-0521

# **UDEOTERM**

# Expanding Horizons in Text Display

Videoterm increases your Apple 11® display to a full capacity 80 columns. Proofreading text problems are a thing of the past. With Videoterm your text is displayed in upper and lower case characters with true descenders utilizing a 7 by 9 character matrix. The time-tested Videoterm is compatible with most word processors and is available with alternate character fonts. Once you've explored the advantages of Videoterm, you'll discover a whole new world for you and your Apple ][.

Suggested retail price: \$345.00

#### ACCESSORIES

Videoterm Utilities Disc includes:

- · Graphics Template System
- Font Editor
- Mid-Res Graphics
- Applesoft Read Screen Utility
- Top & Bottom Scrolling
- Pascal Vidpatch
  - Suggested price \$37.00

Videoterm Character Set

- **EPROMs**
- •German
- •Inverse
- •Katakana (Japanese)
- Math & Greek Symbols
- Norsk
- N. European •French

  - Russian
  - Spanish
  - •Super & Subscript Suggested price
  - \$29.00 each.

Dvorak EPROM [Enhancer]—\$29.00 Lower Case Chip [Rev 7 & up]-\$29.00

#### SOFT VIDEO SWITCH



The Soft Video Switch is an automatic version of the popular Switchplate. It knows whether it should display 40 or 80 columns or Apple graphics. It does the tedious work of switching video-out signals so you don't have to. The Soft Video Switch can be controlled by software. May be used with any Videoterm with Firmware 2.0 or greater. The single wire shift mod is also supported. Package price is \$35.00.

#### ENHANCER ][



The Enhancer ][ features a typeahead buffer. Your keyboard has upper and lower case, and will auto repeat any key held down. A single keystroke can become a word or an entire sentence. Controlled by a powerful microprocessor, Enhancer [[ allows you to re-map your keyboard or add specialized features. Changing a chip creates a totally different keyboard. Enhancer ][ Utilities Disc included.

Suggested retail price \$149.00.

### **BYTE Comment**

# Copyrights, Computers, and the Betamax Case

Walter Klasson 77 Seventh Ave., 21P New York, NY 10011

You've spent hundreds and hundreds of hours bleary-eyed in your computer's glare, hoping that your late-night programming obsession really will pay off. You've missed your favorite television shows and your daughter's childhood. People look at you strangely and ask where you've been. Your wife joins Computer Widows Anonymous.

Then one day your great software masterpiece is finally finished. You

About the Author

Walter Klasson, an attorney with a specialty in computer law, is a member of the working group of the New York State Bar Association Subcommittee on Computer Law, which is considering a computer crime statute for New York. Mr. Klasson is author of a machine-language (Z80) word-processing program and president of Softlaw Inc., a consulting firm which specializes in adapting microcomputer/word-processor systems for small law offices.

call out to your wife and kids, and the entire family at long last sits laughing together around your flickering video display, playing your new science-

Copyright is such an absolute right that even "innocent" unauthorized copiers, who may not have known that what they were copying belonged to someone else, are chargeable with infringement.

fiction and fantasy computer game, The Beast That Ate Hoboken.

But someone out there wants to destroy your happiness. He buys a copy of your program only to give or sell a copy to a friend. Maybe the friend gives or sells copies to other people. Maybe the evil spreads. Your royalties fall off. You miss a payment on little Janie's teeth. You can't afford that 10 megabytes of hard disk you wanted. Is there no hope for you anywhere?

Yes, said the United States Ninth Circuit Court of Appeals this past October in what is known as the "Betamax Case." Sitting in California, that middle-level federal court determined that anyone who uses a video-tape recorder (VTR) to make a copy of copyrighted material without permission has infringed upon the copyright owner's statutory rights, even if the copier had no intention to sell the copy to anyone else. While computers weren't involved directly in the Betamax Case, this aspect of the decision seems to apply equally to unauthorized duplication of copyrighted computer software.

This legal development is not so

# IT'S CRISP. IT'S CLEAR. IT'S COMPATIBLE.



# Amdek's Video-300 green phosphor monitor is the easy-reading choice for almost any system—including IBM and Apple.

Everything about our 12" Video-300 monitor was designed to be easy. Easy to read. Easy to use. And easy to match up with practically any computer or word processing system, including the popular Apple and IBM personal computers. So it's easy to see why you should choose Video-300 for your text display needs.

#### Amdek's Video-300 monitor features:

- Non-glare screen to eliminate distracting reflections
- P-31 green phosphor display for no-strain viewing
- 80 x 24 character display

- 18MHz band width 900 lines (center) resolution
- Built-in carrying handle for portability
- Light-weight, industrial-grade cabinetry (only 17 lbs.)
- UL, FCC approved
- Full one-year warranty covering parts and labor

So ask your dealer about Video-300—part of Amdek's complete line of color, green phosphor and black and white monitors. Then match Video-300's performance and price against any other display monitor. For quality and value, you'll choose Amdek.



Amdek Corporation, 2420 E. Oakton St., Suite E, Arlington Heights, IL 60005. (312) 364-1180 • TLX: 25-4786

See our complete product line at the NCC Show, Booth #A-245, in Houston June 7-10.

surprising, although the Ninth Circuit Court did have to reverse the contrary decision of the federal district court below. The Ninth Circuit reiected the argument that so-called noncommercial, personal use should be considered noninfringing under an implied exception to the copyright statute. The court also interpreted the statutory "fair use" exception to the copyright owner's exclusive rights as applying only where the unauthorized copier used the copyrighted material for limited "productive" purposes, such as "criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research," The exception does not apply where the copier merely wanted to use the copied material for the ordinary purposes for which it would be sold.

This part of the Betamax decision seems reasonable enough to me. After all, as the court said, the unauthorized copying of a television program or a movie that is for sale by the copyright owner is in fact quite "commercial" in that it "tends to diminish the potential market" for the product. It is not hard to agree that illegal copying, even for personal use, of someone else's copyrighted "intellectual" property is no more "innocent" then taking anything else of value belonging to another.

The results so far in the Betamax Case may have been of some small comfort to authors and sellers of word processors, computer games, and other relatively inexpensive software (i.e., virtually everything used on a microcomputer), which is easily copied on the rapidly increasing numbers of small computers being sold. But, at least, their copyrights (like those of Walt Disney and Universal Studios, the victorious parties before the Ninth Circuit) have been fully supported by the court.

However, copyright owners of mass-distributed software still face the impracticalities of enforcing numerous separate small claims against individual infringers even though the cumulative dollar loss from widespread software piracy may be very substantial. Unlike phonograph records, for example,

microcomputer software doesn't have to be copied on relatively centralized and specialized counterfeiting equipment, which can be discovered and closed down. On the contrary, as with VTRs, the small-computer software pirates can do their dirty work in the privacy of the home, with little special expertise, cost, or equipment. Also, many small software houses simply don't have the resources necessary to go after the infringers they do suspect. Manufacturers of expensive software for larger computers, whose customers are usually a limited number of relatively responsible business organizations, don't share these problems. In short, although the Ninth Circuit's opinion labels most unauthorized copiers of smallcomputer software as copyright infringers, the practical difficulties of enforcing the copyright owner's legal rights remain.

While the first part of the Betamax decision could have been predicted. the second part is potentially a very significant new legal development. The Ninth Circuit also decided that the manufacturer and sellers of a VTR on which illicit copies are made (in this case, the defendants were various divisions of Sony, its advertising agency, and four retail stores) are equally liable for copyright infringement. Even more interesting, the court suggested that a possible solution to the video-tape piracy problem would be to charge the VTR manufacturers a royalty to be paid to the copyright owners. Think of the possibly staggering implications in the halls of Xerox of this novel legal conclusion if it were applied to photocopiers!

"Aha," the small-software author might think upon hearing this news, "a manufacturer of computer 'reproduction' equipment (for example, disk drives, cassette players, or any system incorporating them) is a big enough target for me to sink my legal teeth into for some relief (i.e., money) for all this pirating of my Beast That Surfed at Santa Cruz computer game."

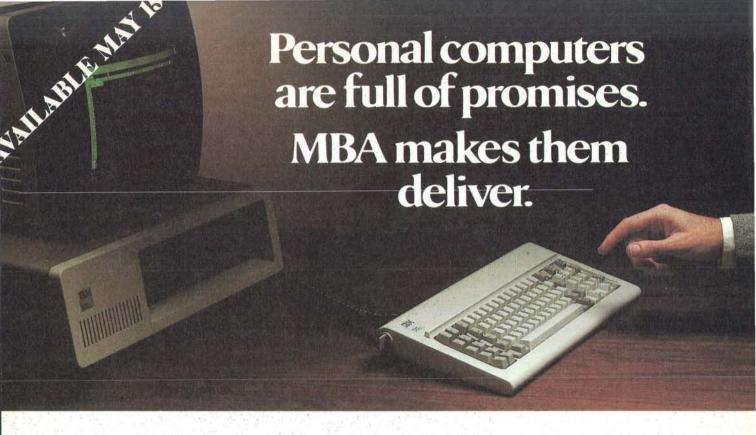
Still, maybe the sound of eyeballs dropping out of heads did not accompany receipt of the news of this part

The Context
MBA will be
available
starting
May 15, 1982
at leading
personal
computer
retailers.
For the
name and
address of your
nearest dealer,
call or write
Context.

# Context Management Systems

23864 Hawthorne Blvd. Torrance, CA 90505 (213) 378-8277 Telex 181149 WEST LSA

Circle 119 on inquiry card.



You've heard how the personal computer is going to revolutionize the way you work.

So far, the reality hasn't measured up to the promises. But now there's a remarkable new software package that transforms the IBM Personal Computer into an incredibly powerful management tool (Apple and Xerox owners: read on).

### The first totally integrated management software.

There are a lot of useful programs available for personal computers.

Unfortunately, they all seem to use different commands and different ways of storing data. This creates two major problems:

 Every time you want to add a new function, you have to learn a whole new command language.

You may not be able to exchange data between different programs.

But now there's a better way. It's called the MBA, and it was created by a blue-chip management consultant, an MIT-trained systems designer, and some of the country's most experienced business programmers.

For the first time, MBA combines all the essential management functions in one easy-to-use package:

**Electronic Spreadsheet.** The ultimate financial modeling tool that lets you create a giant spreadsheet of figures and text. Change one number, and every affected item is instantly re-calculated.

Word Processing. Compose, edit, and print any kind of document. Make revisions yourself—faster than you can explain them to your secretary. Because MBA is an integrated system, it's easy to incorporate data from its other modules into a report you're writing.

**Data Management.** A sophisticated electronic filing system that lets you store information—ANY information—then retrieve it, analyze it, and generate reports to your specifications.

**Graphic Output.** For those occasions when a picture tells your story better than words, you can easily generate clear, readable graphs.

**Communications.** Tie into your company data center, a financial information service, or virtually any other computer system. MBA automatically retrieves the information you want, and lets you edit or rearrange it with a few keystrokes.

#### Easy to learn. Easy to use.

MBA's designers devoted great care to giving it a simple, consistent set of commands. So when you've learned one module, you'll immediately be comfortable with the others.

#### What, where, and how.

MBA is offered through selected computer retailers who have qualified people to demonstrate and answer questions.

It runs on the IBM Personal Computer, with Xerox and Apple versions available soon. But whichever machine you use, MBA will make a dramatic improvement in your personal productivity.

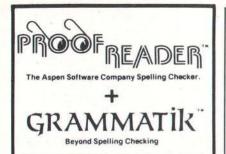
And that's a promise.



## Context Management Systems, Inc. Management software for personal computers.

23864 Hawthorne Blvd., Suite 101 Torrance, California 90505 (213) 378-8277

© Copyright 1982 Context Management Systems, Inc.



#### THE ONLY COMPLETE PROOFREADING PACKAGE

FOR ALL CP/M, MS-DOS. AND TRS-80 WORD PROCESSORS

We'll match Proofreader with any other spelling checker on the market. It has a big 38,000 word expandable dictionary, and can check even your largest documents in under four minutes. Proofreader looks up every word, and does not use less accurate root word analysis like some others. Full interactive correction is standard on CP/M and TRS-80 Model II systems, and is a low cost option for the TRS-80 Model I/III.

Spelling checking alone is not enough! No one else has anything like Grammatik! It analyzes your document for common typos, punctuation errors, misused phrases, and poor writing style. Grammatik is receiving rave reviews from both critics and users. Bob Louden in InfoWorld (12/7/81): "Grammatik is a surprisingly fast and easy tool for analyzing writing style and punctuation. If you are currently doing original writing on a word processor, you should consider this product." Eric Balkan in The Computer Consultant: "I'm impressed with the imagination that went into this product." A user: "Thanks for making my life easier!"

Grammatik and Proofreader are compatible with all CP/M, MS-DOS (including IBM PC), and TRS-80 word processors

Current CP/M formats:

standard 8". NorthStar, Omikron TRS-80.

Please call or write for details of minimum system sizes, and availability of additional disk and operating system formats. Shipping costs included.

Please specify your system configuration when ordering. Dealer inquiries invited.

MS-DOS versions scheduled for March 1982 release.

Proofreader Grammatik CP/M, MS-DOS TRS-80 Model II \$129.00 \$149.00 \$99.00 \$99.00 TRS-80 Mod. I/III \$59.00 (Model I/III interactive correction option - \$30.00)

Trademarks: CP/M: Digital Research; TRS-80: Tandy Corp.; Proofreader, Grammatik: Aspen Software Co.



P.O. Box 339-B, Tijeras, NM 87059 (505) 281-1634

of the Betamax decision wherever they make or sell disk drives. A brief legal and political explanation is in order to explain how the court found the VTR manufacturers liable along with the copiers and why, nevertheless, Tandy, Apple, Shugart, Percom, and many others may not have to raise their prices to pay royalties so that software authors can retire in luxury (or afford new shoes).

Copyright is such an absolute right that even "innocent" unauthorized copiers who may not have known that what they were copying belonged to someone else are chargeable with infringement. The difference in potential liability is that "innocent" unauthorized copiers, as opposed to deliberate infringers, might escape liability for full statutory minimum money damages, although they would probably be subject to an injunction (a court order that they not repeat the infringing behavior).

In the Betamax Case, however, the Ninth Circuit found that the defendants were not innocent, in that (although the legality of taping television broadcasts was in question) they knew that VTRs would be used to reproduce copyrighted materials and were in fact manufactured, advertised, and sold with that primary purpose in mind because virtually all television programming is copyrighted. The court therefore charged the manufacturers with "contributory infringement." On the other hand, the court, facing the reality of a popular and growing multimilliondollar industry recognized that an injunction (i.e., shutting the industry down) might not be appropriate and that the whole question of providing relief for the copyright owners was "exceedingly complex." But while suggesting the royalty mechanism, the court directed the district court below (which must, in the first instance, fashion the relief for the winning side) not to "be overly concerned with harm" to the VTR manufacturers.

Thus, by this time every good attorney who represents a manufacturer of modern technological "reproduction" equipment of any kind is busy "distinguishing" the Betamax Case-that is, showing how his client's circumstances are significantly different from a VTR manufacturer's so that the Betamax decision should not apply. An obvious distinction in the small-computer area is the lack of any "free" source of copyrighted software for computer system buyers comparable to the extremely widespread broadcast of television programs. However, "the airwaves are free" argument sometimes heard (that copyright owners should lose their rights by broadcasting their works) is likewise not available in defense of computer software piracy. which is a more clear-cut form of infringement.

Another important distinction between VTRs and small-computer systems is that most of the latter are not promoted primarily as a means of duplicating copyrighted software but rather as requiring the purchase of certain copyrighted software (e.g., operating systems) and facilitating the general use of other purchased copyrighted applications software. Fully programmable systems even facilitate the creation of more copyrightable software, which is supportive of copyright's goal of promoting creativity. In contrast, what percentage of VTR owners have or really use video cameras?

In other words, even if you agree with the Ninth Circuit's implicit determination that most VTR owners are potential copyright infringers, most small-computer owners probably aren't. So it would be much more difficult to argue that most small-computer manufacturers and sellers were profiting from or encouraging copyright infringement to such a degree that they should be held liable as contributory infringers.

Even VTR manufacturers may not have to worry about the Ninth Circuit's Betamax decision. First, although at this writing it is still too early to know exactly what legal steps will be taken, Sony is likely to appeal to the United States Supreme Court which could reverse (or affirm) the Ninth Circuit on any number of grounds that could be more (or less) favorable to manufacturers of various types of reproduction equip-

# Childhood's End: The 68000

# ADDRESSING THE NEW FRONTIER... THE MICROCOMPUTER COMES OF AGE.

SAGE COMPUTER TECHNOLOGY IS NOW MANUFACTURING A 68000 BASED SINGLE-BOARD MICROCOMPUTER SYSTEM WHICH DELIVERS THE HIGHEST. PERFORMANCE PER UNIT PRICE OF ANY COMPUTER IN HISTORY.

# THE SAGE II MICROCOMPUTER HAS THE FOLLOWING FEATURES: • INTERRUPT DRIVEN, 8 MHZ 68000 MICROPROCESSOR • 2 MILLION, INSTRUCTIONS PER SECOND, NO WAIT STATES

- WILL ADDRESS 16 MEGABYTES WITH UP TO 1/2 MEGABYTE OF PARITY RAM ON BOARD
  - UP TO 1.3 MEGABYTES OF 5-1/4 INCH FLOPPY DISK STORAGE
    - FULLY SUPPORTED IEEE-488 INTERFACE

    - TERMINAL AND MODEM RS-232C SERIAL PORTS
  - CENTRONICS COMPATIBLE PARALLEL PRINTER PORT UCSD PASCAL, BASIC, FORTRAN AND ASSEMBLER AVAILABLE

TM U OF CALIFORNIA

PRICES FOR THE SYSTEM START AT \$3600. FOR MORE INFORMATION CONTACT OUR MARKETING

COMPUTER TECHNOLOGY

Circle 367 on Inquiry card

HORTH EDISON WAY, SUITE 14 · RENO, NEVADA 89502



# simply

- 13" RGB Color.
- 16 Colors on your Apple III® or IBM.
- # Up to 80 Characters per line.
- # 360 Dots per color. (horizontal resolution)
- # Available for immediate shipment.

Other models available:

12" Green Phosphor (1200 lines resolution) \$179.00

12" Black & White (15 Mhz)

\$139.00

Contact your local dealer or call us direct.

Toll Free 1-800-258-6370



M TECO

R Apple III is a registered trademark of Apple Computer.



18 Bridge Street, Salem, NH 03079 Tel. (603) 893-2047 TWX: 710-366-0502

ment. Second, and perhaps more important, the United States Congress may act to set limits on copyright law. While copyright protection is mandated by the Constitution, its exact limits (such as the scope of its "fair use" exception) are a matter of federal statute. Within six weeks of the Betamax decision, at least one bill that, if enacted, would effectively overrule the Ninth Circuit was introduced in each house of Congress.

It is easy to imagine the vast industrial forces that might be arrayed against the Betamax decision, although the decision also has many important supporters among the owners of television, movie, and other copyrights. Intensive lobbying is probably now taking place, but Congress is likely to defer final action

If the Ninth Circuit's Betamax decision is judicially or legislatively overturned, the problem of the enforceability of the copyrights on inexpensive massdistributed software still remains.

until the Supreme Court has spoken, which probably won't be before the fall of 1982. "Friends of the court," representing various groups whose interests could be affected by the final judicial decision, may introduce additional briefs or arguments.

If the Ninth Circuit's Betamax decision is judicially or legislatively overturned, the problem of the enforceability of the copyrights on inexpensive mass-distributed software will remain. If the decision is allowed to stand and if it should be extended to the small-computer industry, then any royalty imposed would probably be passed on to the purchaser in higher prices on the hardware affected, almost like a tax on the entire class for the presumed piracy of a lesser number of individuals. This could reduce sales slightly.

Granting that such a royalty mechanism is not a perfect remedy for the software piracy problem, it is still certain that if there is insufficient legal or economic protection for inexpensive mass-distributed software, its availability will be reduced accordingly. While the actual incidence and cost of software piracy are not precisely known, it is likely to grow rapidly along with increased sales of computers and could become an additional economic barrier to the emergence of new small-software sources. All software authors may have to contend with an unacceptable uncertainty as to the exact economic potential of particularly valuable and innovative software.

The value to a hardware manufacturer of numerous sources of software that supports its system has at last been admitted by no less than IBM in connection with its new Personal Computer. Tandy and Apple, whether they admit it or not, owe much of their small-computer success to the multitudes of independent software sources for their machines, each of which is also promoting the hardware. There is currently software of great practical or entertainment value (as well as the inevitable rubbish) for the microcomputer market that costs anywhere from \$10 to a few hundred dollars. Much of this software is a product of a relatively individualistic, labor-intensive cottage industry. Many members of this cottage industry could not individually support the expense of a full-blown legal defense of their copyrights.

Perhaps the answer is some simple form of voluntary cooperation by those united in interest, as is done in other areas of copyright law. For example, many composers and songwriters are paid royalties from such organizations as the American Society of Composers, Authors, and Publishers (ASCAP) and Broadcast Music Inc. (BMI), which have been legally designed to collect an appropriate amount from those who want to play, perform, or otherwise "copy" the protected material (for example, radio stations). Some type of centralized, less voluntary royalty system established as the result of the

# PICKA WINNER

Be Picky. Get Economy, Quality, Flexibility and Compatibility from Board Level Products to Complete Multi-User Computer Systems.

Bank Selectable
S-100 128K Memory.
Systems Group's new
128K dynamic memory
board has eight independent 16K software selectable
memory banks, each addressable
on any 16K boundry. It's jumper
selectable so you're not PROM
locked in to any one configuration.
And with more advanced features,
it's the most flexible in the
industry.

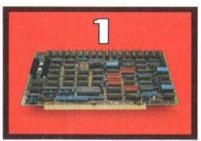
Fully Compatible — S-100 Boards. Use any of Systems Group's bank select memory boards for Alpha

Micro, Cromemco/CROMIX, Dynabyte, North Star, MP/M, OASIS and most other S-100 systems. Other high quality S-100 microcomputer boards include the newest high performance single and multi-user Z80 CPU board with up to 4 serial I/O's, floppy and hard disk controllers with Super CP/M and much more. All fully burned in and tested.



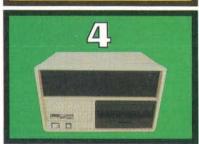
Eight-Inch Add-On Floppy Disk, Hard Disk, and Tape Drive Subsystems. This series was created to

provide a full range of mass storage products to complement the System 2800 computers. The subsystems also offer universal systems expansion to the users of other S-100 systems.











Series 2800 Business
Computers. Systems
Group offers a choice
of expandable systems
with dual floppies (up
to 2.4M Bytes) or hard disk (up to
40M Bytes) w/ floppy (1.2M Bytes)
or tape (20M Bytes) for back-up.

Expandability. Addon memory, I/O and drive subsystems means never being trapped into systems without flexibility. With Systems Group's reliable designs you can add more floppy and hard disk drives or tape back-up for increasing mass storage requirements. Add more memory and I/O for up to 12 independent users per system. Choose from Super CP/M, MP/M II, or OASIS operating systems.

Come to Systems Group for any of your microcomputer needs. Everything from our new 128K Memory Board to complete systems. We're helping make computers what they should have been in the first place.

All Systems Group's products are warranteed for one year. Ask about our 30 day dealer/ OEM evaluation policy.

CP/M and MP/M are Registered Trademarks of Digital Research. OASIS is a Trademark of Phase One Systems. Inc.



A Division of MEASUREMENT systems & controls incorporated 1601 Orangewood Avenue Orange, California 92668, (714) 633-4460 TWX/TELEX 910 593 1350 SYSTEMGRP ORGE

See us at the Houston Astrovillage & Astrodomain during NCC '82 or at COMDEX/Spring '82 in Atlantic City.

For dealers only, circle 401. All other inquiries, circle 402. Betamax decision could perform a similar function for software authors, unless Congress or the industry acts to produce some better method of protecting the copyrights involved.

Another legal alternative might be to increase deterrence to software piracy by increasing the criminal sanctions available against copyright infringers. However, this leads into the wholly separate area of computer crime (which is beyond the scope of this article) and away from the copyright law's primary focus on civil, not penal, enforcement of the statutory right. While greatly increasing the minimum statutory money damages awardable against deliberate infringers and including the copyright owner's legal fees in those damages might be effective deterrents, such measures, which would have to be enacted by Congress, do not appear to be under serious consideration.

Of course, assorted hardwarebased technological solutions to the piracy problem, such as unduplicatable disks or ROM cartridges, exist. While often technologically effective, these methods are not always popular with users, limit the standardization and interchangeability of the various manufacturers' products, and don't encourage independent software sources to write for the machine involved. (A word of caution: those who provide information or equipment to defeat hardware or software antipiracy measures could be chargeable with contributory copyright infringement under the Betamax decision.)

It is therefore easy to predict, without knowing exactly what will or should be done, that the outcome of the Betamax Case and any other legal developments involving computer software piracy could have an important effect on the makeup of the small-computer industry. The courts have designed copyright law to promote human creativity. As the Ninth Circuit stated, "this purpose is to be achieved by reliance on the economic

incentives granted to authors and inventors by the copyright scheme." Such a purpose is not being served where the more widely distributed and lower-priced products of human creativity may have the least effective protection because of technological and social factors. Perhaps, then, some form of royalty system for software copyright owners would help to remove the economic Catch-22 facing small-software authors as a result of the proliferation of small computers for which their programs are sold and on which their work may also be stolen. In any case, in the world of inexpensive computer software, events may now be taking place that will determine just what economic threshold must be crossed before copyrights are really of any value.

Occasionally, BYTE invites industry leaders to comment on topics related to the microcomputer industry. The opinions expressed by these authors are their own and do not necessarily express the opinions of BYTE or its publishers.

# DATAFACE GRQ SERIES INTERFACE

### TURNS YOUR ELECTRONIC TYPEWRITER INTO A PRINTER/TYPEWRITER

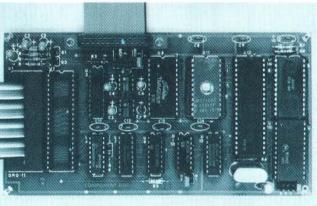


The Dataface GRQ-11 Interface expands your Olympia ES Series or Rem-

mington 200 Series electronic typewriters into a letter press quality printer for your personal or business computer. And, you still have a fully featured electronic typewriter—two machines in one.

The GRQ Series Interface features:

- 1. Standard EIA RS-232-C Serial Interface and Parallel (Centronics compatible).
- 2. Standard asynchronous ASCII code, 7 bit data; 1 start bit; accommodates 1 or 2 stop bits automatically; accommodates odd, even or absence of parity bit.
- 3. Fifty thru 9600 Baud data rate options.
- 4. Two K buffer; supports X-on, X-off protocol as well as RTS signals.





5. Circuit board is installed inside typewriter back panel along side logic board. The

connection between boards accomplished by 40 pin jumper cable using existing socket. No soldering required. Power is provided to the GRQ thru two pins of the 40 lead cable. Installation in 10 minutes.

GRQ-10 — CALL FOR SPECIAL WHOLESALE PRICE. SUGGESTED RETAIL \$349.50.

# DATAFACE INC.

2372 A WALSH AVE., SANTA CLARA, CA 95050 (408) 727-6704

30 May 1982 © BYTE Publications Inc.

# WICAT 68000 MULTI-USER SYSTEM 150

#### STANDARD EQUIPMENT

68000 Processor
256KB RAM
10MB Winchester
5¼" Floppy Disk Backup
5 RS-232 C Serial Interfaces
Parallel Port
Multibus™
WICAT Operating System
Choice of One Language

#### HARDWARE OPTIONS

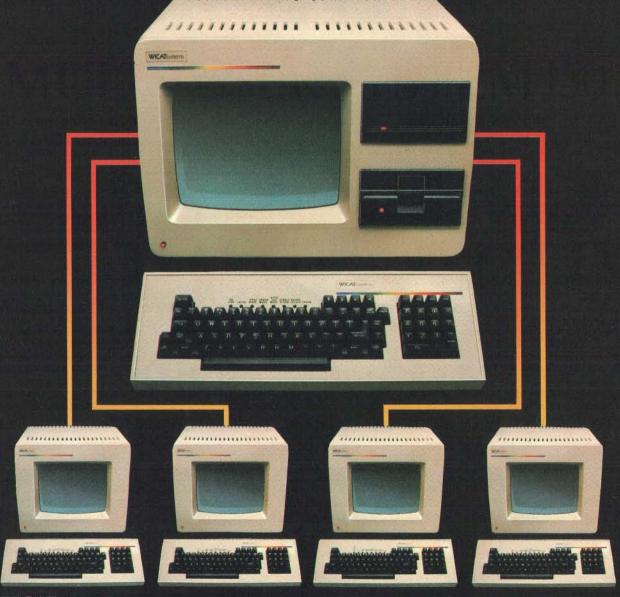
Graphics CRT
Up to 1.5MB RAM
Communications: Auto Answer
and Auto Dial (1200 Baud)
Local Networking
Videodisc Interface

#### **SOFTWARE OPTIONS**

UNIX™ V/7 CP/M™ Emulator

#### LANGUAGE SUPPORT

PASCAL
C
FORTRAN
BASIC
APL\*
COBOL
ADA™
LISP
Assembler



**WICAT**systems

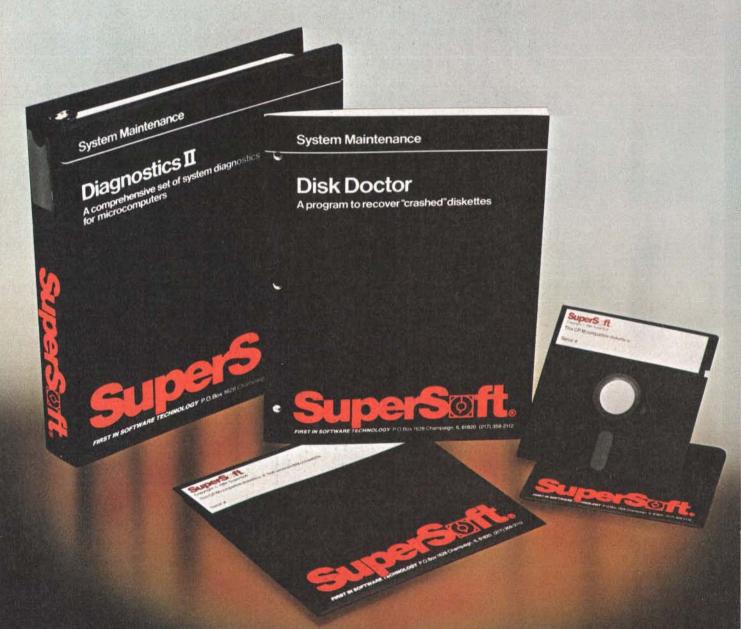
Call or write WICAT Systems for additional information.

\*\*UNIX is a trademark of Bell Labs. Multibus is a trademark of INTEL.

P.O. Box 539 1875 South State Street Orem, Utah 84057 (801) 224-6400 ADA i

ADA is a trademark of the United States Dept. of Defense CP/M is a trademark of Digital Research APL.68000 is a product of the Computer Company

# How to keep cool when your system goes down.



SuperSoft offers programs designed to check out a downed computer or recover a crashed diskette. Fast.

#### SuperSoft's System Maintenance Series

Diagnostics II

Diagnostics II is the finest set of system maintenance routines available for microcomputers. Diagnostics II thoroughly checks all five areas of your computer system: memory, printer, terminal, disk, and CPU, pinpointing hardware problems to help you keep your system in perfect working order. (Requires: 32K CP/M)

Diagnostics II: \$125.00 Manual Only: \$15.00

#### **Disk Doctor**

Disk Doctor is a program which automatically recovers "crashed" diskettes or accidentally erased files. It will place all readable information from a "crashed" file into a good file, and it will unerase files which have been erased but not overwritten. Disk Doctor will not function completely on some double-sided disks.

(Requires: 48K CP/M and two drives for

complete operation) Disk Doctor: \$100.00 Manual Only: \$15.00

System Checker

System Checker is a diagnostic program which will check your entire computer system quickly with very little user interaction. It was designed to be used by persons with no knowledge of computer hardware. (Requires: 32K CP/M)

System Checker: \$75.00 Manual Only: \$15.00

#### Disk-Edit

Disk-Edit is a screen oriented disk editor. It gives you complete access to all the raw information on your disk, in both hex and ASCII, with scrolling. Disk-Edit will let you examine or alter files that cannot be accessed with a normal text editor.

(Requires: 32K CP/M) Disk-Edit: \$100.00 Manual Only: \$15.00

#### Also Available From SuperSoft:

Language Series:

Ada\*: \$250, C: \$200, LISP: \$150, BASIC: \$200, FORTRAN: \$275, RATFOR: \$100, FORTH: \$200, TINY PASCAL: \$85, Z8000 ASSEMBLER: \$500.

**Financial Planning Series:** 

ScratchPad: \$200, Data-view: \$200, Stats-graph: \$200, Optimizer: \$200.

**System Utilities:** 

Term II: \$200, Utilities Packs I & II: \$60 each, Elink: \$250, Encode/Decode II: \$100, BCD: \$300.

**Entertainment Series:** 

Nemesis: \$45, Dungeon Master: \$40, Analiza II: \$50.

Word Processing:

Star-Edit: \$225, TFS: \$85.

Available from fine dealers everywhere, or directly from SuperSoft.

U.K. and European Distribution: Digital Devices, 134 London Road, Southborough Kent, Tunbridge Wells, TN4 OPL, England. Tel. Tunbridge Wells (892) 37977/9 Telex. 95582.

Japanese Distribution: ASR Corporation International, 3-23-8, Nishi-Shimbashi, Minato-Ku, Tokyo 105, Japan, Tel. (03)-437-5371. Telex. 0242-2723.

\*Ada is a trademark of the Department of Defense (Ada Joint Program Office). CP/M is a registered trademark of Digital Research. SSS FORTRAN copyright Small Systems Services. Unix is a registered trademark of Bell Laboratories.

SuperSoft software available for virtually all CP/M systems. Please specify your system. Most products also available for CP/M-86 and IBM PC DOS. Please inquire.



FIRST IN SOFTWARE TECHNOLOGY P.O.Box 1628 Champaign, IL 61820 (217) 359-2112 Telex 270365

## Ciarcia's Circuit Cellar

# Everyone Can Know The Real Time

Technological advances have made real-time clocks simple and inexpensive.

Steve Ciarcia POB 582 Glastonbury, CT 06033

It's almost three years now since I last discussed real-time clocks. Much has happened since I wrote "Anyone Know the Real Time?" (reference 1). Back then real-time clocks were usually put together either from existing digital watch or clock chips or from a series of TTL (transistor-transistor logic) counters. Microprocessor-bus-compatible real-time-clock chips were just emerging and were very expensive. I had to phrase my article title as a question.

Today, of course, real-time clocks are established, cost-effective products. The expense of adding a true millisecond-to-month time-of-day clock to a personal computer is barely more than the cost of the cheapest, most primitive clock of the kind in wide use just a few years ago. Today, with very little trouble, everyone who really wants to can know the real time.

This month I'd like to update the story a little and describe how to con-

nect one of the latest products of realtime-clock technology to a microprocessor-based computer system, using a minimum-component circuit with battery backup, and I'll show how you can put together an intelligent clock that can function as a standalone peripheral device which communicates time data over a serial communication link to a remote computer upon command. But first, some background information.

#### What Is Real Time?

Why do we need a clock to keep "real" time? Does this mean there exists "unreal" time?

Before we think too hard about what seems to be a philosophical conundrum, let's consider for a moment a typical application where a computer monitors a number of physical parameters and triggers a series of sequentially timed control outputs in response to certain changes in the parameters.

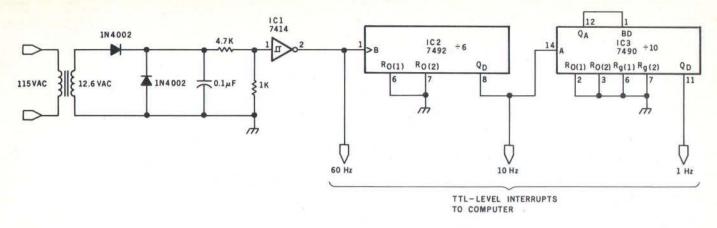
Suppose you have a computer controlling the lights in your home and that you want the control computer

Copyright © 1982 Steven A. Ciarcia. All rights reserved.

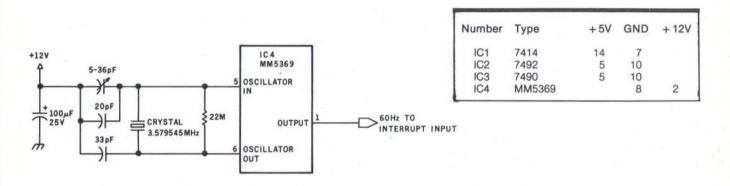
Z8 is a trademark of Zilog Inc. Diagrams and tables pertaining to the MM58167A and the MM58174A are reprinted courtesy of National Semiconductor Corporation.



**Photo 1:** No longer must we assemble real-time clocks from digital-watch parts or from small-scale-integrated circuits. National Semiconductor has introduced two components that do all the hard work: the MM58167A and the MM58174A.



**Figure 1:** Schematic diagram of a simple real-time clock that uses the 60-Hz power-line frequency as a reference. This provides the computer with only regular pulses or "heartbeat ticks"; the time of day must be kept by software.



**Figure 2:** A simple real-time-clock circuit that relies on a crystal oscillator for its timebase. As in figure 1, the only output is a series of regular pulses.

to be able to tell when you are arriving home so that it can turn on the entrance light and turn it off when you get inside.

One way of setting up such a system is to place a pressure-sensitive switch under the doormat with a connection running to one of the computer's control inputs. As you approach the door and step on the mat, the computer's job is to sense the switch closure and turn the light on for, say, 200 seconds before turning it off. To perform these operations, the computer must be directed by a program which embodies a control algorithm that says, at least in part, "Turn the light on when the switch is closed, and then turn the light off later."

Now here's the catch. An algorithm cannot by itself tell how long the computer's hardware takes to perform any part of the algorithm. But you will be quite aware of how long the entrance light stays on, as directed by the control algorithm. So the algorithm must use some means to make 200 seconds pass in your real perception before turning the light off and moving to other tasks.

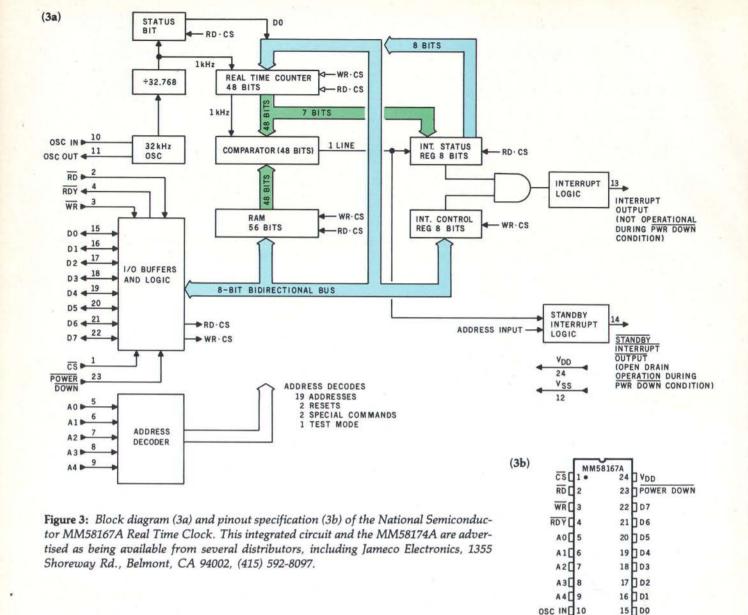
This is what we mean when we say that a computer keeps track of "real time." An algorithm that may execute at different speeds on different hardware is tied to external events. A hardware circuit or hardware/software combination that accurately records time with respect to an external observer is called a real-time clock.

#### Limitations of Software Timing

In our simple entrance-light application, it's not very hard to write a program that will satisfy us. We can

use a short BASIC program that monitors an input bit and sets an output state, incrementing a counter variable in a FOR. . .NEXT loop to provide the 200-second delay. Perhaps 5000 iterations of a 40-ms (millisecond) loop would do the trick.

But what happens if the problem becomes more complex? Suppose we have a second light inside the house and a second mat with a switch under it, with a similar need for the computer to turn the light on for a specified duration. We have to add another set of delay statements to our simple BASIC program, and when we add something, it changes the execution time of the original timing loop. While we could make the FOR. . . NEXT-loop method work for two lights, the complications mount quickly as the problem becomes larger.



#### Hardware Marks Real Time

We escape the convolutions of the software approach by using special hardware circuitry that maintains a record of true elapsed time irrespective of software execution speeds. These circuits can take many forms, but generally such real-time clocks fall into either the time-of-day or "heartbeat-interrupt" category.

The heartbeat-interrupt clock is less expensive and uses fewer or simpler components, but more software interaction is needed to perform all the housekeeping chores, while a time-of-day clock does almost everything with hardware, requiring relatively little interaction with software.

#### Heartbeat-Interrupt Clocks

Figure 1 and figure 2 on page 35 show examples of two heartbeat-interrupt circuits, which were the feature attractions of my previous article. The circuit of figure 1 uses a crystal as a convenient timebase, while the circuit of figure 2 uses the 60-Hz power line. Both produce a single regular pulse (a clock "tick") at intervals of some precise fraction of a second. (Typical systems produce a tick at intervals of 1/60, 1/40, and 1/10 second.) The output line of the circuit is connected to an interrupt input on the processor.

Every time the clock ticks, the processor stops what it is doing and increments an elapsed-ticks counter in memory. When the processor needs to know the real time, it must calculate the time from the number of ticks. For example, using a 1/60-second timebase, a count of 10,860 corresponds to 181 elapsed seconds.

TOP VIEW

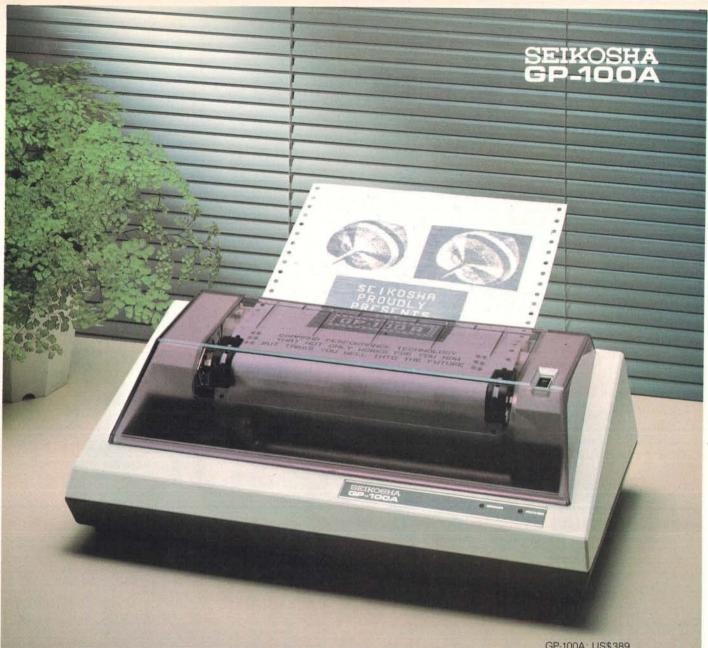
14 T STANDBY INTERRUPT

13 TINTERRUPT OUTPUT

OSC OUT 11

VSS 12

Generally, a computer system with a heartbeat-interrupt clock is initialized with the time of day when it is turned on, with the initialization time stored either in the ticks counter (which is said to count ticks from midnight) or in a separate location (to be summed with the ticks when the value of the time is needed).



GP-100A: US\$389

## COMMAND PERFORMANCE.

#### Seikosha gives you all the best features—including economy and super-clear graphics.

Unlike some graphic printers, Seikosha's new GP-100A Uni-Hammer Graphic Printer puts full dot addressable graphic at your command. The GP-100A lets you repeat a column of data as many times as needed with just one command. Software control enables double-width character output, and the positioning is both character and dot addressable. Designed for simple operation, it ranks among the most cost-efficient graphic printers on the market. Command performance technology that not only works for you now, but takes you well into the future.

#### Other valuable features:

- · Graphics, regular and double width character modes can be intermixed on the same line.
- Automatic printing. When the text exceeds the maximum line length, there is no loss of data due to overflow.
- · Self-test printing is a standard feature.
- Centronics type parallel interface.
- · Paper width is adjustable up to 10 inches.
- Optional Interface: RS232C, IEEE488, apple II, etc.

Graphic Printer ( ) Beries



Distributed by AXIOM CORPORATION 1014 Griswold Avenue San Fernando, Calif. 91340 Phone (213) 365-9521 TWX (910) 496-1746 Manufactured by SEIKOSHA SYSTEM EQUIPMENT DIV. 4-1-1 Tainei Sumida-ku ToRyo Japan. Phone: 03-623-8111 Telex: 262-2620

... Everything from Apple II to Zork II at the lowest possible prices.

But low prices are only one feature of our new catalog. We think you'll find it to be a very well-organized, wellwritten reference tool.

When you receive our catalog, you get with it our commitment to help you keep it up to date.

Unlike most catalogs that are obsolete the moment they're printed, ours was specifically designed to deal with the rapid-fire changes in microcomputer hard and software. Its loose-leaf binder format makes it a snap to add the new pages we'll send out on a regular basis.

Our catalog was developed on exactly the same principles as our business - to offer you the lowest possible prices combined with the highest quality of service.

16K RAM KITS.... 13.95 Set of 8 NEC 4116 200 ns. Guaranteed one full

#### DISKETTES

	•				-	_
AL	DL	ΙΛ.	DI	C	K	e

Single sided, certified Double Density with Hub-ring Box of 10. Guaranteed VERBATIM DATALIES

VENDATINI DATALIFE	
MD 525-01, 10, 16.	26.50
MD 550-01, 10, 16	44.50
MD 557-01, 10, 16.	54.95
MD 577-01, 10, 16	34.80
FD 32 or 34-9000	36.00
FD 32 or 34-8000	44.95
FD 34-4001	40.00

ALPHA DISKS21	.95
Single sided, certified Double Density 40 Tra	acks.
with Hub-ring. Box of 10. Guaranteed on	e full
year	

#### VERBATIM DATALIFE

MD 525-01, 10, 16.	26.50
MD 550-01, 10, 16.	44.50
MD 55, 31, 10, 16	54.95
MD 577-01, 10, 16	.34.80
FD 32 or 34-9000	
FD 32 or 34-8000	.44.95
FD 34-4001	

#### DISKETTE STORAGE

8" PLASTIC LIBRARY CASE	3.50
PLASTIC STORAGE BINDER w/ Inserts	9.95
PROTECTOR 5 % " (50 Disk Capacity)	23.95
PROTECTOR 8" (50 Disk Capacity)	29.95
DISK BANK 5%"	5.95
DISK BANK 8"	6.95

#### **NEC PERSONAL** COMPUTERS

PC-8001A	CPU		899	00
PC-8012A	1/0		559	00
PC-8033A	DISK I/O		125	00
PC-8031A	DUAL DISK		899	00

#### **ALTOS COMPUTER** SYSTEMS

Call Alpha Byte for our low Altos prices.

#### ATARI COMPUTERS

ATARI 800	699.00
ATARI 400 (16K)	339.00
ATARI 810 DISK DRIVE	449.00
ATARI 850 INTERFACE	449.00
ATARI 410 PROGRAM RECORDER	79.00
EPSON CABLE	35.00
MEMORY MODULE (16K)	89.95
JOYSTICK CONTROLLERS	10.00
PADDLE CONTROLLERS	19.95
STAR RAIDERS	35.00
MISSILE COMMAND	35.00
ASTEROIDS	35.00
INTER DEDIDUEDALE	

#### INTEC PERIPHERALS RAM MODULES

8K	FOR	ATARI	400	279.	00
2K	FOR	ATARI	800	135.	00

#### **ACTIVISION ATARI** CARTRIDGES

LAZAR BLAST	21.9
SKIING	21.9
DRAGSTER	21.9
BOXING	21.9
CHECKERS	21.9
BRIDGE	450
AND THE RESERVE	

PE	
A COM	
The state of the s	
FOR ATA	
	NAME OF THE OWNER OWNER OF THE OWNER

DRAGSTER	
BOXING	
CHECKERS	4
BRIDGE	
AND DESCRIPTION OF THE PERSON	

The Home	
CD SCILATIFIC	115.95
BUSINESS	128.95
37E BUSINESS	64.95
HP-32E SCIENTIFIC W/ STATS	46.95
HP-33C Programmable Scientific	76.95
HP-41C Advanced Programmable	211.95
HP-41CV Advanced Prog 2K mem	274.95
UD 44 DEDIDUEDALO	

#### **HP-41 PERIPHERALS**

27.9
89.0
324.9
119.0
419.0
29.0
29.0
39.0
29.0
39.0

HP-85A PERSONAL COMPUTER	21.95
HP SINGLE 54"DISK DRIVE	12.95
HP DUAL DISK DRIVE	19.95
HP-85A 16K MEMORY MODULE	239.00
HP-7225B GRAPHICS PLOTTER	21.95
HP PLOTER MODULE	. 605.00
HP HP-IB INTERFACE	329.00
HP STD APPLICATIONS PAC	83.00
HP GENERAL STATISTICS PAC	83.00

## **PRINTERS**

HP VISICALC PLUS

HP GRAPHIC PRESENTATIONS

HP PRINTER/PLOTTER ROM

HP MASS STORAGE ROM HP RS-232 INTERFACE

ANADEX DP 9500	
ANADEX DP 9501	1295.00
C-ITOH F-10 40 CPS PARALLEL.	1595.00
C-ITOH 45 CPS PARALLEL	1770.00
C-ITOH 40 CPS SERIAL	1870.00
C-ITOH PROWRITER PARALLEL	549.00
C-ITOH PROWRITER SERIAL	695.00
C-ITOH COMET I	289.00
EPSON MX-80	SCALL
EPSON MX-80 F/T	SCALL
EPSON MX-100 GRAPHIC	SCALL
EPSON GRAFTRAX	90.00
EPSON GRAFTRAX IDS-445G PAPER TIGER	779.00
IDS-460G PAPER TIGER	945.00
IDS-560G PAPER TIGER	1195.00
IDS PRISM 80 W/O COLOR	1099.00
IDS PRISM 132 W/COLOR	
NEC SPINWRITER 3510 S. RO	1995.00
NEC SPINWRITER 3530 P. RO	1995.00
NEC SPINWRITER 7710 S. RO	2545.00
NEC SPINWRITER 7730 P. RO	2545.00
NEC SPINWRITER 7700 D SELLUM	2795.00
NEC SPINWRITER 3500 SELLUM	
OKIDATA MICROLINE 80 OKIDATA MICROLINE 82A	389.00
OKIDATA MICROLINE 82A	549.00
OKIDATA MICROLINE 83A	799.00
OKIDATA MICROLINE 84	1199.00
QUME 9/45.	2149.00

#### CORVUS

## FOR S-100, APPLE OR TRS-8

	1, 111		THE REAL PROPERTY.
Control	er, Case/F	Ontal	
5	BYTES		31.
10	BYTES		464
20	YTES		554
	K-UP		

BSA	DIGI	TIZER		259.	00
	KEYPAD			119	
Minomon OFT	Z-80 S0	FTCARD		29	
MICROSOFT				15	
VIDEX 80 x 2	4 VIDEO			299	01
VIDEX KEND	GARD ET	OB	D.	129	a
VIDE				. 99	
VID OF	1	DIE		. 29	01
			DES	315	00
	MID	In.		165	00
20	ARP	REACE	MIL	135	00
				44	95
Oyen	NUMA TO A STATE OF THE PARTY OF			54	95
PADDLE	E			34.	95

#### APPLE HARDWARE

VERSA WRITER DIGITIZER	259.00
ABT APPLE KEYPAD	119.00
ABT APPLE KEYPAD MICROSOFT Z-80 SOFTCARD	.299.00
MICROSOFT RAMCARD	
VIDEX 80 x 24 VIDEO CARD	
VIDEX KEYBOARD ENHANCER II	129.00
VIDEX ENHANCER REV 0-6	
VIDEX SOFT SWITCH	29.00
M & R SUPERTERM 80 x 24 VIDEO BD	315.00
SSM AIO BOARD (INTERFACE) A & T	165.00
SSM AIO BOARD (INTERFACE) KIT	
APPLE FAN	44.95
T/G JOYSTICK	54.95
T/G PADDLE	34.95
VERSA E-Z PORT	21 95
MICRO SCI A2 W/O CONTROLLER	419.00
MICRO SCI A40 W/CONTROLLER	479.00
MICRO SCI A40 W/O CONTROLLER	409.00
MICRO SCI A70 W/CONTROLLER	629.00
MICRO SCI A70 W/O CONTROLLER	549.00
THE MILL-PASCAL SPEED UP	329.00
PROMETHEUS VERSACARD	229.00
SUPERCLOCK II	
LAZAR LOWER CASE +	
MICROBUFFER II 16K W/GRAPHICS	
MICROBUFFER II 32K W/GRAPHICS	299.00
WIZARD 80 COL VIDEO	279.00

#### MONITORS

NEC 12"	GREEN	MONITOR	 19

NEC 13" COLOR MONITOR	399.00
SANYO 12" MONITOR (B & W)	249.00
SANYO 12" MONITOR (GREEN)	269.00
SANYO 13" COLOR MONITOR	469.00
ZENITH 13" HI RES GREEN MON.	139.00
AMDEK COLOR I	389.00
AMDEK RGB COLOR	859.00
AMDEK RGB INTERFACE	169.00

#### MOUNTAIN HARDWARE

159.00

116.00

329.00

CPS MULTIFUNCTION BOARD	199.00
SUPERTALKER SD200	259.00
ROMPLUS W/ KEYBOARD FILTER	179.00
ROMPLUS W/O KEYBOARD FILTER.	_ 130.00
KEYBOARD FILTER ROM	49.00
COPYROM	49.00
MUSIC SYSTEM	369.00
ROMWRITER	149.00
APPLE CLOCK	252.00
A/D + D/A	299.00
EXPANSION CHASSIS	. 625.00

#### CALIF. COMPUTER SYSTEMS

#### S-100 BOARDS

0 100 20111100	
2200A MAINFRAME	459.00
2065C 64K DYNAMIC RAM	539.00
2422 FLOPPY DISK CONT. & CP/M®	359.00
2710 FOUR SERIAL I/O	279.00
2718 TWO SERIAL/TWO PARALLEL I/O	269.00
2720 FOUR PARALLEL I/O	
2810 Z-80 CPU	4

#### APPLE BOAR

## YSTEMS

## 100 BOARDS

200	MIC RA		
12	CON	P/M®	
4	WO A	-	3 00
1	1/0		199.00

#### INTERFACE 149.00 159.00 INTERFACE CENTRONICS INTERFACE

#### VISTA COMPUTER CO.

APPLE	VISION	80-80 COL CARD	329.00
APPLE	B" DIS	CORIVE CONTROLLER	549.00

#### MODEMS

NOVATION CAT ACQUISTIC MODEM	145.00
NOVATION D-CAT DIRECT CONNECT	165.00
NOVATION AUTO-CAT AUTO ANS	.219.00
NOVATION APPLE-CAT	349.00
UDS 103 LP DIRECT CONNECT	175.00
UDS 103 JLP AUTO ANS	209.00
HAYES MICROMODEM II (APPLE)	299.00
HAYES 100 MODEM (S-100)	325.00
HAYES SMART MODEM (RS-232)	249.00
HAYES CHRONOGRAPH	225.00
LEXICON LX-11 MODEM	109.00
RACAL VADIC 1200 BAUD/212A	795.00

#### **TERMINALS**

TELEVIDEO 910	639.00
TELEVIDEO 9120	745.00
TELEVIDEO 920C	830.00
TELEVIDEO 950C	995.00
ZENITH Z-19	.799.00

#### TRS-80 MOD I HARDWARE

PERCOM DATA SEPARATOR	.27.00
PERCOM DOUBLER II	159.00
TANDON 80 TRACK DISK DRIVE	429.00
TANDON 40 TRACK DISK DRIVE.	289.00
LNW DOUBLER W/ DOSPLUS 3.4D	159.00
MOD III DRIVE KIT	649.00

	MORROW DESIGNS		Z-TERM*	89.95	TRACKCESS MOD I	24.95	EDU-WARE	
	FLOPPY DISK SYSTEMS		Z-TERM PRO*	129.95	OMNITERM SMART TERM. MOD I, III	89.95	PERCEPTION PKG.	19.95
	Controller, P.S., Microsoft Basic, CP	1149	ASCII EXPRESS HAYDEN APPLESOFT COMPILER	63.95 149.00	MICROSOFT BASIC COMP. FOR MOD I. LDOS 5.1 MOD I. II.	165.00 159.00	COMPU-READ	
	A & T.	/ IVI	EASY WRITER-PRO	199.00	EDOS D.T MIDD I, II	109.00	STORY TELLER	18.95
		69.00	EASY MAILER-PRO	79.00	APPLE GAMES		COMPU-MATH: ARITHMETIC COMPU-MATH: FRACTIONS	
		99.00	EXPEDITER II APPLESOFT COMPILER	73.95	PERSONAL SOFTWARE		COMPU-MATH DECIMALS	34.95
	DISCUS 2 + 2 (Single Drive - 1 MEG) 10		A-STAT COMP. STATISTICS PKG SUPER TEXT II	129.00	CHECKER KING	24.05	COMPU-SPELL (REQ. DATA DISK)	
	DISCUS 2 + 2 (Dual Drive — 2 MEG) 19	99.00		199.00	GAMMON GAMBLER	21.95	COMPU SPELL DATA DISKS 1-4, ea	17.95
	HARD DISK SYSTEMS		LISA 2.5	59.95	BRIDGE PARTNER	21.95	MORE GREAT APPLE	
	Controller, P.S., Microsoft Basic, CP	/M*	SUPERSCRIBE, II	99.95	MONTY PLAYS MONOPOLY	AT THE	GAMES	
	A & T.		CONTINENTAL SOFTWA	ARE	ZORK I	20.00	OMPUTER QUARTERBACK	32.95
		99.00	G/L	199.00	MONTY	32.95	RPEOC FIRE	
	DISCUS M26 (26 Megabytes) 37	49.00	A/R	199.00	2222		ERED ALLIANCE	. 49.95
	ICOL ATORS		A/P	99.00			U-V ARE	
	ISOLATORS		PAYROLL PROPERTY MGMT	THE OWNER OF THE OWNER OWNER OF THE OWNER	ALIP	De C	CEPHON PKC	19.95
		53.95	THE HOME ACCOUNTANT	95			EOMPU-REAP	95
	ISO-2 6-SOCKET	53.95	PERSONAL S		IDNI	1.95	STORY TEL	
	BARE DRIVES		DESKTO		IDNI - Inherentalia (1)	95	1111	
		-	VISIE		JUARKS.	*	COMPU-MA CIMA	34.95
	TANDON 51/4 INCH		VISI D/VISIPLOT	B	PERSONAL SOFT	W. B.	COMPU-POLISK)	24.95
	100-1 SINGLE HEAD 40 TRK 100-2 DUAL HEAD 40 TRK	19.00	VISI	199.00	CHECKER KING	HIS ST	OMPU L DAME BISKS 1-4, ea	17_95
	100-2 DOAL HEAD 40 TRK	· V	VISIT	79.00	GAMMON PRINCE P	2	GREAT APPLE	
	100-4 DUAL H		VISIFILE	209 00	TY PL TONOPOL	29	GAMES	
	FID.			ALC: N	RK I	32.95	COMPUTER QUARTERBACK	32.95
		9.00	CONTINENTAL SOFT	MALL	KIII	32.95	TORPEDO FIRE	
	48-2	49.00	G/L	100	TY PLAYS	34.95	THE SHATTERED ALLIANCE POOL 1.5	49.95
		2000 400	A/R	O OO	FRE		ULTIMA	
	101		A/B	99.00	ALAXY WARS	20.95	RASTER BLASTER	24.95
١	3-SOCKET	40 000	The state of the s		ALIEN RAIN (AKA GALAXIAN)	20.95	FLIGHT SIMULATOR	27.95
A	30-2 6-SOCKET		100	59.95	ALIEN.TYPHOON	20.95	INTERNATIONAL GRAND PRIX	
	4		P L SOFTWARE		APPLE PANIC. MIDNIGHT MAGIC	24.95	SHUFFLE BOARD	29.95
	BARE DR	THE		199.00	SPACE QUARKS	24.95	FIREBIRD	
	514		P	179.00	AUTOMATED SIMULATIO		SNACK ATTACK	
1	THE RESERVE AND ADDRESS OF THE PARTY OF THE	19.00	VISIT /VISIPLOT	239.00	INVASION ORION		THIEF ROACH HOTEL	24.95
7		99 00	NOTIERM	199.00 79.00	STAR WARRIOR	32.95	JABBERTALKY	
١	100-3	99.00		199.00	TUES MORNING QUARTERBACK		THE WARP FACTOR	. 32.95
Α	100-4	29.00	VISIFILES	209.00	CRUSH, CRUMBLE AND CHOMP.		COSMO MISSION	24.95
	ON THINLINE 8 INC	H			THE DRAGON'S EYE	20.95	CURRILE	
		59.00	CP/M® SOFTWARE		MUSE SOFTWARE		SUPPLIES	
	848-2 DUAL SIDE	49.00	THE WORD-SPELL CHECK	75.00	ROBOT WARS		AVERY TABULABLES	
				599.00	THREE MILE ISLAND	32.95	1,000 3½ x 15/16	
	MICRO PRO			229.00 239.00	GLOBAL WAR	20.95	3,000 3½ x 15/16. 5,000 3½ x 15/16.	
	APPLE CP/M®		P & T CP/M® MOD II TRS-80			24.95	5,000 3 12 x 13/10	
		49.00	COMMX TERMINAL PROG	.82.50	ON LINE CYCTEMS		FAN FOLD PAPER	
			C BASIC 2		ON-LINE SYSTEMS WIZARD AND PRINCES	29.95	(Prices F.O.B. S.P.)	
	Maria Company of the	90.00	PASCAL Z PASCAL MT+		MISSILE DEFENSE	25.95	9½ x 11 18lb WHITE 3,000 ct	29.00
	SPELLSTARIM* ** 1	69.00		205.00	SABOTAGE	20.95	14 7/8 x 11 18lb WHITE 3,000 ct	39.00
	CALCSTARIM* ** 1	69.00	SYSTEMS PLUS -	And the	SOFT PORN ADVENTURE			
	CP/M®		G/L, A/R, A/P, P/R		THRESHOLD	24.95		
	WORDSTAR	10.00		579.00 849.00	CROSSFIRE	16.45		
	SUPERSORT 1				TIME ZONE	.69.95		
	MAILMERGE 1 DATASTAR 2		DIGITAL RESEARCH	90.00	H/R FOOTBALL	32.95		
	SPELLSTAR 1		SID		H/R CRIBBAGE PEGASUS II			
	CALCSTAR 2		ZSID			- Serem		
	A STATE OF THE STA		PL/ 1-80	439.00	SIRIUS SOFTWARE SPACE EGGS	04.00		0
	MICROSOFT		SUPERSOFT		GORGON			
	APPLE		DIAGNOSTIC I	69.00	SNEAKERS		A DEPOSITE	
	FORTRAN*	65.00	DIAGNOSTIC II		EPOCK		COMPITE	<b>-</b>
	BASIC COMPILER*	15.00	'C' COMPILER		BEER RUN		COMILOIF	
	COBOL* 5 Z-80 SOFTCARD 2	95.00	UTILITIES II		PULSAR II		PRODUCT	R
	RAMCARD 1		RATFOR		EPOCK.		FINDUC	0
	TYPING TUTOR	17.95	FORTRAN					
	OLYMPIC DECATHLON		TD0 00 011170		To order or fo	or in	formation o	oll.
	TASC APPLESOFT COMPILER	29.00	TRS-80 GAMES		To order, or fo	A III	iornation, C	all.
	CP/M®		TEMPLE OF APSHAI		10101		2000	
	BASIC 80	99.00	HELLFIRE WARRIOR					
	BASIC COMPILER 3 FORTRAN 80 3		STAR WARRIOR					
	COBOL 80. 5	95.00	CRUSH, CRUMBLE AND CHOMP	24.95	Towns		where there are the control control	0070
	MACRO 80	89.00	INVADERS FROM SPACE.	17.95	To use our 24-hour mor	gem or	der line, call: (213) 8834	09/6.
	mu MATH/mu SIMP	19.00	PINBALL	17.95	100 (27) (47) (27) (47)			CONTRACTOR OF THE PARTY OF THE
	mu LISP/mu STAR1	75.00	STAR TREK 3.5. MISSILE ATTACK	18.95		102	If anything is wrong, return th	
	APPLE SOFTWARE		STAR FIGHTER		and we'll make it right. And, o			
							all orders; COD up to \$300.00	
	MAGIC WINDOW	79.00	TOC ON COLTIMADE		Add \$2 00 for standard LIPS	chinning	and handling on orders under	50 lhs

Circle 12 on inquiry card.

DB MASTER

PFS: PERSONAL FILING SYSTEM

79.00

59.00

59.00

99.00

179.00

79.00

79.00

**TRS-80 SOFTWARE** 

NEWDOS/80 2.0 MOD I, II.

PROSOFT NEWSCRIPT MOD I, III

X-TRA SPECIAL DELIVERY MOD I, III

SPECIAL DELIVERY MOD I. III

LAZY WRITER MOD I, II

MAGIC WINDOW

BASIC MAILER

PFS: REPORT ...

139.00

165.00

99.00

119.00

199.00

Add \$2.00 for standard UPS shipping and handling on orders under 50 lbs,

delivered in continental U.S. Call for shipping charges over 50 lbs. Foreign,

FPO and APO orders, add 15% for shipping. Californians add 6% sales tax.

31245 LA BAYA DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91362

Prices quoted are for stock on hand and subject to change without notice.

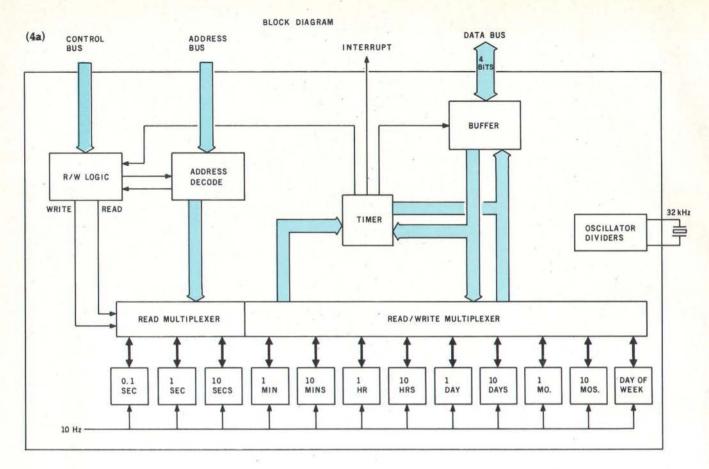


Figure 4: Block diagram (4a) and pinout specifications (4b) of the National Semiconductor MM58174A Real Time Clock.

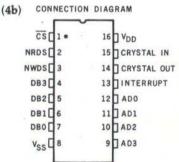
The heartbeat-interrupt clock has some disadvantages. First, it is totally dependent on the processor's execution time and interrupt-handling capability. When the processor must interact with multiple peripheral devices, often there can be competition for the processor's attention. Computers from one major manufacturer actually ignore the clock at times, shutting it off while I/O (input/output) operations with the disk drive are taking place. The value of this clock is questionable because it loses a second or two with every disk operation.

The second criticism of heartbeatinterrupt timing is volatility. Since the time of day is kept only in software, the clock works only when the computer is powered. It is impossible to keep the clock running all the time without keeping power applied to the processor and part of the program memory, which can be an expensive undertaking.

#### What Is a Good Clock?

The ultimate solution is a separate hardware time-of-day real-time clock interfaced to the processor but running independently. Such a clock should keep track of the time of day to a resolution of milliseconds and should, with battery backup, never need to be reset. Additional features should include variable-rate processor interrupts (once per millisecond or once per month as required) and alarm-clock (coincidence of a preset time-of-day value) interrupts. Fortunately, these capabilities can be added to your system with a modest amount of hardware.

National Semiconductor Corporation has simplified the business of



putting a versatile real-time clock in a computer by introducing two CMOS (complementary metal-oxide semiconductor) LSI (large-scale integrated) circuits, the MM58167A and MM58174A. These real-time-clock chips are designed for direct connection to the control and data buses of common microprocessors. Figure 3 on page 36 is a block diagram of the MM58167A, and figure 4 is a block diagram of the MM58174A.

#### Real-Time Clock: the MM58167A

The MM58167A is packaged in a 24-pin DIP (dual-inline package) and contains a 48-bit (14-digit) counter chain clocked from a 32,768-Hz

# CASH FLOW PROBLEMS?



## IT'S NICE TO KNOW SOMEONE WHO HAS THE SOLUTION.



MicroAge is your Solution Store . . . that means at MicroAge Computer Stores we have a wide selection of time-saving computerized business systems designed specifically to solve the daily cash flow problems every businessman faces.

MicroAge has computerized business systems that

quickly and affordably allow you to regain control of your critical accounts receivable... at last making it possible for you to carry out effective collection procedures on a consistent basis. MicroAge has accounts receivable program packages to automatically display and update account information; prepare trial balance including a balance-due and delinquency aging

report, and take care of dozens of other tasks that eat into your time and profit!

Computerized business systems from the Micro-Age Computer Store are available in the \$5,000 to \$15,000 range, to suit the individual budget of your small business or professional practice. MicroAge backs up every system with personalized service, warranty service and repair, installation, systems consulting, even customer training. Visit the MicroAge Computer Store in your area soon with your business problems, and let us help you with the solution.

## MicroAge. computer store

"The Solution Store" SM

#### VISIT THE STORE IN YOUR AREA:

El Paso, Texas (915) 591-3349 Rockville, Maryland (301) 762-7585 Tucson, Arizona (602) 790-8959 Albuquerque, New Mexi (505) 883-0955 Pleasant Hill, California (415) 680-1489

Aurora, Colorado (303) 696-6950 Rochester, New York (716) 244-9000 Hurst, Texas (817) 284-3413 Salina, Kansas (913) 823-7596 Orland Park, Illinois (312) 349-886 Milwaukee, Wisconsin (414) 257-1100 Mountain View, California (415) 964-7063 Scottsdale, Arizona (602) 941-8794 Anchorage, Alaska (907) 279-6688 San Diego, California Richardson, Texas (214) 234-5955 Minneapolis, Minnesota (612) 338-1777 Omaha, Nebraska (402) 339-7441 Phoenix, Arizona (602) 265-0065 Indianapolis, Indiana (317) 849-5161 Porlland, Oregon (503) 256-4713 Norwalk, Conneticut (203) 846-0851 St. Louis, Missouri (314) 567-7644 Oklahoma City, Oklahoma (405) 728-1837 Houston, Texas (713) 440-7547 W. Palm Beach, Florida (305) 683-5779 Toronto, Canada (416) 487-5551 Houston, Texas (713) 270-9647 Wilmington, Delaware (302) 368-3672 Allentown, Pennsylvania (215) 434-4301

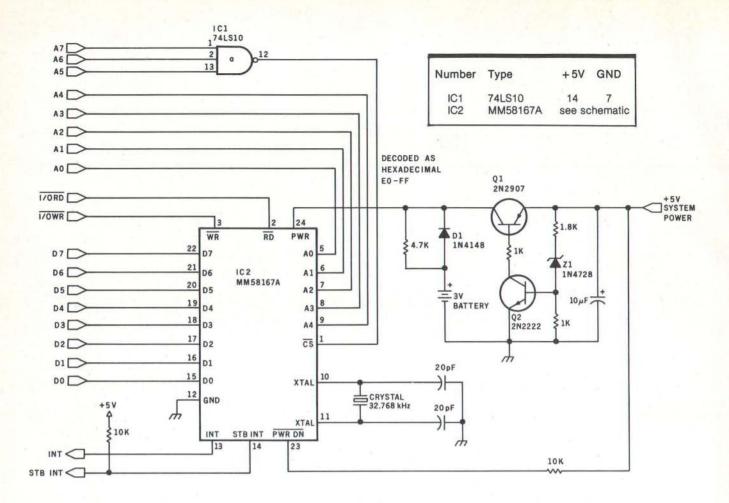


Figure 5: Schematic diagram of a real-time-clock circuit employing the National Semiconductor MM58167A suitable for direct connection to the bus of a microprocessor-based computer system (Z80, 8080, or 8085). The clock registers are addressed by input/out-put instructions that reference a set of addresses mapped into the I/O-address space of the processor. Provision is made for keeping the clock running when the computer system is turned off by supplying power from two 1.5-V alkaline battery cells, which should maintain operation for several months.

crystal-reference oscillator. The MM58167A can keep track of and communicate to the processor the time in any increment from 1/10,000 second to months. (Usually, submillisecond resolution isn't required except in critical instrumentation or arguments over processor benchmarks.)

The MM58167A contains a storage latch consisting of 56 bits of on-chip RAM (random-access read/write memory). With backup power from a battery supplied to the clock chip, this storage can be used to keep any desired quantity or time while the system is powered down, or, in the "alarm-clock" mode, to contain a value to be compared to the real-time counter (either in its entirety or against individual digits in the counter). Occurrence of a match be-

tween the storage latch and the counters is signaled on a maskable interrupt line called the Standby Interrupt, which is active in the low logic state.

Another output, called simply the Interrupt Output (active high), can provide the heartbeat interrupt described earlier. This output can be programmed to provide clock ticks at seven regular rates (ten times per second [10 Hz], once a second [1 Hz], once a minute, once an hour, once a day, once a week, and once a month) and when a comparison match occurs between the storage latch and the real-time counter.

#### Real-Time Clock: the MM58174A

National Semiconductor's second real-time-clock chip, the MM58174A, is a 16-pin integrated circuit with somewhat fewer talents (but a lower cost) than the MM58167A. The timing chain is derived from a 32,768-Hz oscillator, as in the MM58167A, and it counts time intervals from 1/10 second through months. The other major difference is the MM58174A's lack of the comparison-match interrupt. However, the MM58174A does have a tick interrupt programmable for intervals of 1/2 second, 5 seconds, or 60 seconds.

As I write this, the price/performance ratio of the 58167A is more attractive than that of the 58174A, so I have based my construction project solely on the MM58167A.

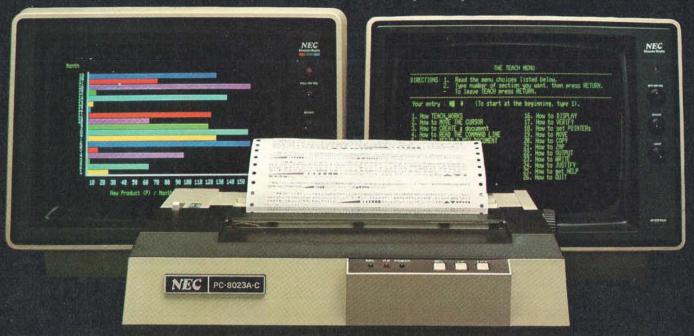
#### Real-Time-Clock Interface

Figure 5 is the schematic diagram of a real-time-clock circuit that incorporates the MM58167A. The circuit is

# Give your system some NEC, and watch its performance soar.

NEC's crisp, clear, high-performance JC1202 RGB color monitor, an industry standard. Also available: the JC1201 composite video version.

NEC's classic green monitor, (JB1201), one of computing's performance legends. Non-glare screen, easy on the eye. And the checkbook.

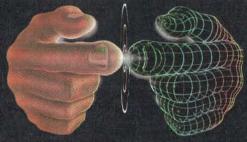


The impressive new NEC dot matrix printer. Parallel interface, 100 cps, 2K buffer, pin or friction feed. Stunning performance and versatility in the hottest new peripheral of the year.

Peripherals from NEC can make almost any computer system better.

Owners of Apple®, Radio Shack®, Atari®, IBM®, and many other personal computers will find their equipment to be compatible with NEC's famous monitors, as well as our highly-featured new PC-8023A dot matrix printer. (Some configurations may require a different interface.)

Ask your dealer for a demonstration.



Productivity at your fingertips

NEC Home Electronics (USA)
Personal Computer Division

1401 Estes Avenue Elk Grove Village, IL 60007

A4	АЗ	A2	A1	A0	Function
0	0	0	0	0	Counter-ten thousandths of seconds
0	0	0	0	1	Counter-hundredths and tenths of seconds
0	0	0	1	0	Counter—seconds
0	0	0	1	1	Counter-minutes
0	0	1	0	0	Counter—hours
0	0	1	0	1	Counter—day of week
0	0	1.	1	0	Counter-day of month
0	0	1	1	1	Counter-month
0	1	0	0	0	RAM—ten thousandths of seconds
0	1	0	0	1	RAM—hundredths and tenths of seconds
0	1	0	1	0	RAM—seconds
0	1	0	1	1	RAM—minutes
0	1	1	0	0	RAM—hours
0	1	1	0	1	RAM—day of week
0	1	1	1	0	RAM—day of month
0	1	1	1	1	RAM—months
1	0	0	0	0	Interrupt Status register
1	0	0	0	1	Interrupt Control register
1	0	0	1	0	Count Reset see table 2
1	0	0	1	1	RAM Reset See table 2
1	0	1	0	0	Status bit
1	0	1	0	1	Go command
1	0	1	1	0	Standby Interrupt
1	1	1	1	1	Test mode

**Table 1:** Address codes and functions for registers and comparison latches (RAM) in the National Semiconductor MM58167A Real Time Clock.

relatively simple to attach to most personal computer systems, requiring only an 8-bit data bus and 5 address lines.

The read  $(\overline{RD})$ , write  $(\overline{WR})$ , and chip select  $(\overline{CS})$  lines on the clock chip are similar to those found on memory devices. To read any register in the clock, external circuitry must place signals on the RD and CS lines while the proper address appears on the address lines; similarly, to write data into the clock registers, external circuitry must enable the WR and CS lines while the address appears. The data bus serves as the data path in and out of the counters and latches: values are loaded and read in BCD (binary-coded decimal) format. The 5 address lines allow activation of 24 counter and memory functions. which are listed in table 1. (The binary values are equivalent to hexadecimal 00 through 1F.)

The MM58167A can be attached to

virtually any microprocessor bus. For example, in 6502- or 6800-based systems, the MM58167A would be addressed as 32 locations in memoryaddress space. As shown, the circuit of figure 5 contains signals designed to be decoded by the I/O bus of a Z80-, 8080-, or 8085-based computer, with the 24 clock-register addresses extending from hexadecimal E0 to FF. For simplicity and generality, I shall refer to particular registers in this article following the 00 to 1F coding of table 1. When you are using the circuit of figure 5, add hexadecimal E0 to these values.

#### Turned-Off Timekeeping

One important attribute of both the MM58167A and the MM58174A is their ability to operate from battery power when the computer-system power is off. Both chips will continue keeping track of the real time when supplied with power at voltages down to 2.2 volts (V). A small 3-V battery can easily supply the current required (only 20  $\mu$ A [microamps], dissipating 44  $\mu$ W [microwatts] of power).

The circuit of figure 5 contains provision for operating the real-time clock on battery power when the computer is turned off. Transistors Q1 and Q2 serve as a voltage-sensitive on/off switch. When the system power is on at a potential of +5 V. transistor O1 conducts, supplying power to the MM58167A. Diode D1 blocks any large current flow into the battery, but the two alkaline cells do receive a slight trickle charge from the system power through the 4.7k-ohm resistor. In normal operation the MM58167A requires about 12 mA (milliamps).

When the computer is shut off and the +5-V supply drops to 0 V, Q1 opens to keep current from the battery from going onto the system's power bus. Current begins to flow from the battery through diode D1 into the clock chip. At the same time, the PWRDN (Power Down, pin 23) input of the MM58167A senses the low-voltage condition of the power bus and causes the clock to enter the powered-down operating mode.

In the powered-down mode, the clock's three-state I/O lines enter a high-impedance condition, effectively disconnected from the computer, and the current drawn from the power source is reduced from 12 mA to 20 uA. In this mode, which can be activated at any time by placing a 0-V potential on pin 23, the clock continues to keep time, but only the Standby Interrupt remains active (if it was enabled previously). Using the Standby Interrupt and some external power-control circuitry, you could set up your computer to shut itself completely off and then turn itself on automatically weeks later.

#### An Intelligent Clock

Many of you will have no qualms about digging into your computers and adding this simple real-time clock. However, some of us who possess the technical skills to construct the project don't want to em-

"Only VR Data can offer you a Winchester Hard Disk Drive for your IBM Personal Computer...



We are tremendously impressed with the IBM Personal Computer. When we set out to increase its capability with our exclusive,

#### OTHER QUALITY PRODUCTS FROM VR DATA

#### Winchester Hard Disks

6.3 Megabytes

9.6 Megabytes 19.0 Megabytes

2x 6.3 Megabytes

2x 19.0 Megabytes

2x 9.6 Megabytes

Memory Boards with **Error Correction** 

64 Kbytes 192 Kbytes

128 Kbytes

In The Queue

D-Con Direct connect

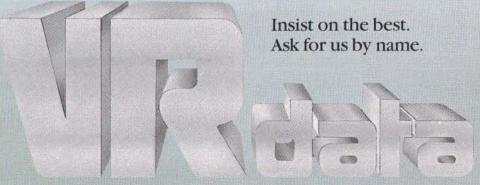
internal modem

The Echo

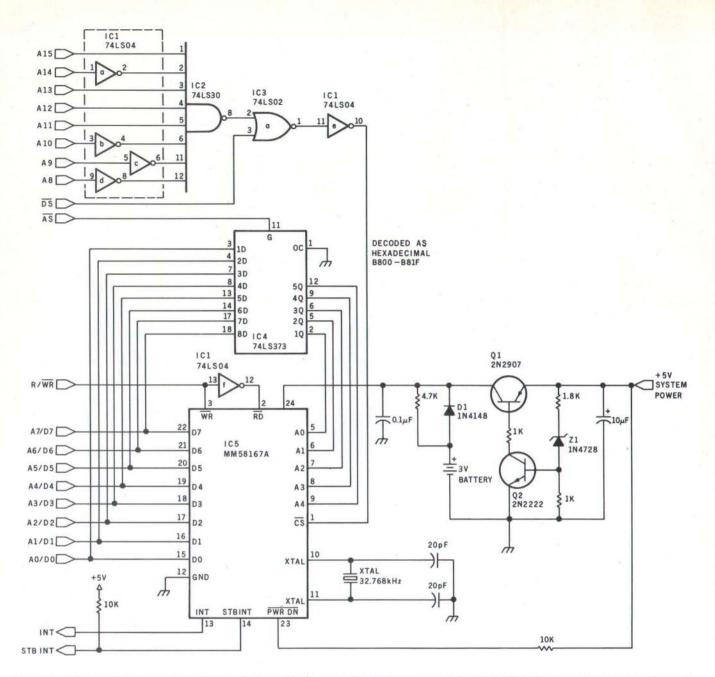
Winchester Backup

totally compatible Winchester Hard Disk Drive and Memory Board, we dedicated ourselves to making the very finest products possible. Some very knowledgeable dealers and users say we've totally succeeded. See for yourself!!

As with our Winchester Hard Disk Drive, all our designs are tested, re-tested and "burned in." We're so sure of our quality control that we offer an unconditional 120 day extended warranty covering full costs of parts and labor on all VR Data products.



777 Henderson Boulevard N-6 Folcroft, PA 19032 800-345-8102



**Figure 6:** Schematic diagram of a real-time-clock circuit that uses the MM58167A and the Z8-BASIC Microcomputer to constitute an intelligent peripheral device that can send information on the date, time, and its status over a serial communication line to a remote computer.

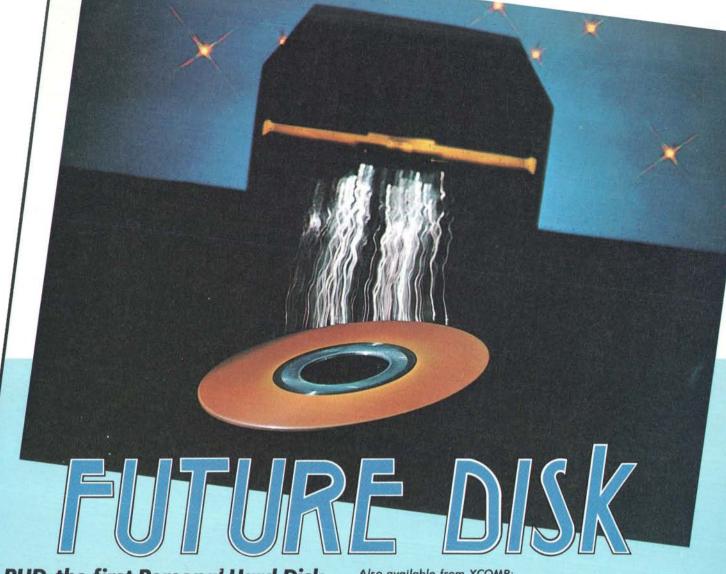
bark on the sometimes dangerous course of modifying our computers. I have to admit to membership in this group to the extent that I don't dare mess with the one computer I use as my word processor. For that reason I wanted to develop an intelligent real-time clock that I could use as an external peripheral device for any computer. As with some of my previous projects, I found that the most convenient and cost-effective means of doing so was to use the Z8-BASIC Microcomputer that I developed last

year (see references 2 and 3).

Using the Z8-BASIC Microcomputer, we can develop an independent real-time clock that can communicate over a serial data link with almost any computer. (You could use another single-board microcomputer with similar results.) We can have almost all the features of the bus-interfaced real-time clock as well as convenient output formatting of the date and time. By adding intelligence to the hardware, software interaction with the real-time clock can be re-

moved from the realm of the operating system and handled by an application program instead.

Figure 6 is the schematic diagram of an intelligent real-time clock consisting of an MM58167A chip interfaced with a Z8-BASIC Microcomputer. (The nomenclature on the left side of the diagram refers to bus signals of the Zilog Z8.) The logic gates IC1, IC2, and IC3 are address decoders. The clock-chip interface is set up to occupy hexadecimal addresses B800 through B81F (corres-



## PHD, the first Personal Hard Disk with full capacity built in backup

Advance to a new degree of computer power and data security with 10 Megabytes: five MB of fast disk storage and 5MB for backup. The savings in operator time will pay for the PHD. Available for a wide range of popular personal computers:

- Apple II all three operating systems on ONE disk. Ties into available low cost networks for education and office automation.
- IBM Personal Computer turns the IBM-PC into the fastest personal computer on the market. Xerox 820 — add your vertical market software packages for a complete business solution. Heath-Zenith and other systems

e compact PHD can also be used as a single 10MB drive. he future you can expand to a 10 imes 10 or 20 MB figuration.

ill dealer program with flooring, service kits and demo age is available now. Suggested List Price: \$3,595.

Also available from XCOMP:

- S100 Hard Disk Subsystem at unbeatable OEM prices
- General Purpose (GP) controllers 8 bit interface with easy interface to microprocessor-based systems
- SG/R GP controller for SA1000 interface
- SM/R GP controller for Storage Module Drives
- AN/R GP controller for ANSI interface disk and tape
- ST/S, SG/S SM/S and AN/S same as above, for the \$100 bus

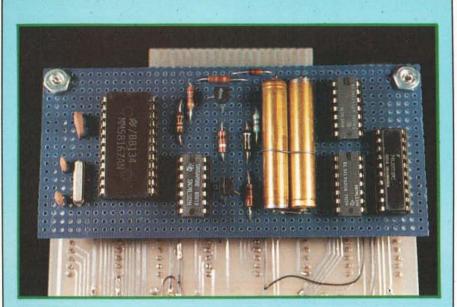
PHD- type subsystems are also available to OEMs.

XCOMP, Inc. 7566 Trade Street San Diego, CA 92121 Tel. 714-271-8730 Tlx. 182786	Dealer Info S100 Other Micro Low Cost S100 Subsystem OEM Sub Mail Info Please call me
Name	
Title	Phone
Company	
Address	

\*Apple II is a trademark of Apple Computers, Inc. IBM Personal Computer is a trademark of IBM Corp. Xerox is a trademark of Xerox Corp. Heath-Zenith is a trademark of Zenith Data Systems

Circle 440 on inquiry card.





**Photo 2:** The prototype of the real-time-clock circuit of figure 6, mounted on the back of a Z8-BASIC Microcomputer, which provides the intelligence and versatility of control of a general-purpose microcomputer.

ponding to register addresses 00 through 1F on the MM58167A). The Z8 has a multiplexed address/data bus, so the octal latch IC4 is required to latch the 8-bit low-order address. Other than that, circuit operation is as described for figure 5, including battery backup.

#### Time-Data Representation

Now that I have described the hardware of the clock interface, we can turn our attention to how to use the real-time clock. Before we start writing programs in BASIC, assembler, or even FORTH, we must understand how the MM58167A stores in its registers the values that represent the current time.

Each unit of time is allotted a twodigit binary-coded-decimal register. Each register has a unique address within the clock chip, which is mapped into the address space of the external logic according to the range of addresses assigned to the clock chip; in the Z8-BASIC Microcomputer, hexadecimal B800 through B81F are the addresses of the clock registers as seen by the outside world.

The BCD internal representation of time is a slight inconvenience when we are programming in a high-level language; we can't directly load the registers with decimal values or read them with statements that assume decimal radix for arguments. But fortunately, the BCD representation maps directly onto hexadecimal representation for the set of numbers used for timekeeping, so we can load and read the registers using hexadecimal-radix operators, if our high-level language has them.

The BASIC/Debug interpreter of the Z8-BASIC Microcomputer can operate on hexadecimal data, identifying hexadecimal variables and constants with the percent symbol (%) as a prefix character. If your language interpreter has no such ability, you may have to explicitly code some decimal-to-hexadecimal (and vice versa) conversion routines.

#### Setting the Clock

The best way to describe the operation of the clock and the computer's interaction with it is to follow a sequence of setting and monitoring the time. For example, choosing a convenient time and date, such as 2:34 p.m. on Friday, May 14, we can set the clock.

First, all the counters are reset by writing hexadecimal FF to the counter-reset register, which lies at the internal clock-register address of hexadecimal 12. Then appropriate values for each time unit are loaded into the corresponding registers. For the date and time chosen, the decimal-radix values would be as follows (with the hours numbered in a 24-hour scheme):

> month: 05 day of month: 14 day of week: 06 hour: 14 minute: 34

As I mentioned before, these twodigit decimal values must be represented in the clock in BCD format. If, for example, we tried to load 34 minutes into the minutes register (at clock address hexadecimal 0B, decimal 11) using the simple integer-arithmetic BASIC statement

#### OUT 11,34

the MM58167A would read the 34 as two BCD digits and interpret it as 22 instead of 34. To avoid this error, we use the equivalent hexadecimal-radix statement

#### OUT 11, %34

instead, with %34 understood to be a hexadecimal constant. (In the Z8-BASIC Microcomputer, the statement would be %0B, %34.) If your computer can't handle hexadecimal numbers, another possibility is to send 52, the decimal equivalent of hexadecimal 34. The statement

#### OUT 11,52

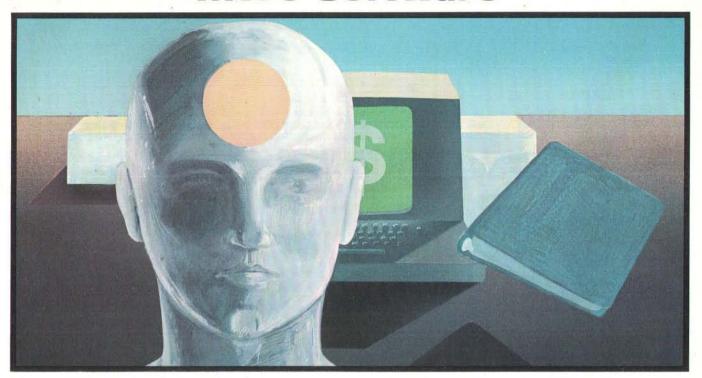
will result in 34 being loaded into the BCD minutes register.

The same problem exists in reading the clock registers. If you try to read the value of 34 minutes in clock register hexadecimal 0B with the BASIC statement

#### PRINT INP(11)

the interpreter will return the incorrect decimal value of 52 minutes. The solution is to print the value of deci-

## How To Sell More Software



## With Better User Manuals

#### An intensive one-day seminar on Writing User Manuals That Sell

If you're an individual software author or a software company in the business of publishing and selling software, or if you'd like to be, you can benefit from this seminar. Unlike seminars that concentrate on the academic do's and don'ts of technical writing and formatting, this seminar gets down to the business value of the user manual as a marketing and sales tool that helps you get more users and keep them.

Developed and conducted by software marketing professionals with over 50 years of collective experience in writing software manuals for the commercial market, this seminar is loaded with facts and ideas on these subjects:

#### **Manual Design**

How to make content, organization, page layout, and document format work to your sales advantage. How to publish attractive manuals that speak well of your software without spending a fortune.

#### Training vs. Reference. Can one manual do both?

How to implement the techniques of tutorial writing into a well organized reference format that provides easy access for later questions.

#### **Packaging That Controls Point of Sale**

How to make your manuals work for you at the point of sale to help the dealer present your software in its most competitive light--both on the shelf and on the demonstration machine.

#### **Automated Manual Writing**

How to let the software document itself wherever

possible, and how to use word processing systems effectively to obtain maximum value from automated publishing tools.

#### Seminar Manual

All attendants will receive a detailed How To manual on writing and producing user manuals for

commercial use. Many past attendants have praised the manual and other handout materials as being worth the price of attendance by themselves.

Schedule:		Chicago	May 21
Boston	May 18	Dallas	May 25
New York	May 19	Los Angeles	May 26
Philadelphia	May 20	San Francisco	May 27

#### Only \$125 With Our Guarantee

Price includes lunch and materials. We offer a 10% discount for companies sending more than one person.

#### **Get Details at Computerland Today!**

Space is limited so make your reservation now. To get enrollment details, simply call [303] 471-9875, or, visit your nearest participating Computerland Store and pick up a complete Seminar Information Packet including an agenda, an outline of the seminar manual, seminar authors' and instructors' resumes and a brochure on Context, Inc.



833 West Colorado Avenue Colorado Sociose CO 80905 D2

C5

D3

D4 CF

D2 C5

AØ

C4 C5 CC C5

D4 C5 C4 A0

**C6** 

C9 CC

C5

D3

AØ

AØ

AØ

AØ

C5

D8

CI

CD

**C9** 

CE

C5

AØ

C1

CE

C4

AF

CF

D2

AØ

DØ

C1

D4

**C3** 

**C8** 

AØ

C1

CE

D9

AØ

C4

C9

D3

CB

AØ

D3

C5

**C3** 

D4

CF

D2

AØ

AØ

AØ

A0

C4

**C9** 

D3

CB

AØ

**D3** 

**D4** 

C1

D4

D5

D3

### Disk Utility for Apple DOS 3.3

C4

C9

D3

C9

D3

DØ CC C1

D9

AO

A6

AØ

DØ

CI

D4

**C3** 

**C8** 

AØ

**D5** 

D4

**C9** 

CC

**C9** 

D4

D9

AØ

CD

C1

CE

**D5** 

C6

C1

**C3** 

D4

D<sub>5</sub>

D2

**C5** 

C4

AØ

C2

D9

AØ

C1

CE

D3

D7

C5

D2

AØ

**C3** 

CF

D2

DØ

AØ

AØ

AO

AØ

AØ

CI

AØ

D3

CF

**C6** 

D4

D7

C1

D2

**C5** 

AØ

CF

CC

## **LOST PROGRAM RECOVERY**

If you haven't written over that program accidentally deleted, this software can recover it for you.

Also, it can reorganize your disk and inform you of the remaining space available.

And, it allows you to patch any sector: display in Hex and ASCII on standard Apple screen.

Menu driven and easy for the novice while still efficient for the professional. Compatible with M & R Superterm.

For more information or to place your order call: (208) 263-1213

### Cost: \$50

We pay first class postage and insurance. You may use VISA or Master Card.

TO ORDER: Send us your check, money order or credit card number and expiration date. Certified checks avoid clearance delay.

ANSWER Corporation CF 502A North Second Ave. Sandpoint, Idaho 83864

AØ AØAØC2D9AØCAC5D2D2D9AØD4C9C6C6D4AØAØ

D0	D1	D2	D3	D4	D5	D6	D7	Counter or RAM Reset
1	0	0	0	0	0	0	0	Ten thousandths of seconds
0	1	0	0	0	0	0	0	Hundredths and tenths of seconds
0	0	1	0	0	0	0	0	Seconds
0	0	0	1	0	0	0	0	Minutes
0	0	0	0	1	0	0	0	Hours
0	0	0	0	0	1	0	0	Days of the week
0	0	0	0	0	0	1	0	Days of the month
0	0	0	0	0	0	0	1	Months

Table 2: Bit specifications for the time-counter and comparison latch (RAM) reset format of the MM58167A.

mal register 11 in hexadecimal. The Z8-BASIC Microcomputer statement

#### PRINT HEX(0B)

Returning to our original example, 2:34 on Friday, May 14 is loaded into the real-time clock's registers with five write commands. In BASIC the statements are

OUT %0F, %05 (month) OUT %0E, %14 (day of month) OUT %0D, %06(day of week) OUT %0C, %14 (hours) OUT %0B, %34 (minutes)

Next, a write pulse to hexadecimal address 15 is performed to reset the thousandths, hundredths, tenths, units, and tens of seconds counters to zero (the data on the address bus is ignored during the execution). This so-called Go command is used only for precise starting of the clock. If the seconds counter is at a value greater than 40 when the Go is issued, the minutes counter will be incremented: otherwise the minutes counter is unaffected. The Go command is unnecessary to start the clock, since the counters count whenever there is power. Instead, it is a convenient way to precisely synchronize at a given instant.

The time-unit counters and comparison (RAM) registers can be reset to zero at any time by setting the appropriate bits according to table 2 and writing to either the Counter

Reset (hexadecimal 12) or RAM Reset (hexadecimal 13) registers.

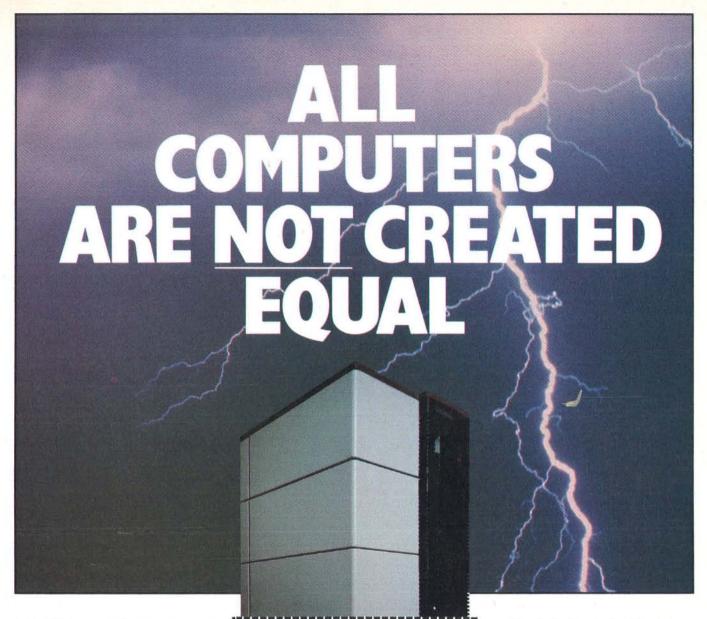
#### Clock Reading and Interrupts

The host processor can find out what time it is by reading the BCD values from registers 00 through 07. To display this information in any different form, you have to write an explicit software routine to convert the numeric output of the real-time clock to the desired format.

The Interrupt Output (pin 13) can be programmed to provide a signal at any of eight different times, as previously discussed. To enable one of these conditions, a logic 1 is written into the Interrupt Control register (hexadecimal 11) at the appropriate bit position corresponding to the desired output frequency. Figure 7 shows the functions of each bit position. (For example, writing hexadecimal 08-a 1 in bit D3-to the Interrupt Control register sets a once-perminute interrupt.)

When a counter rollover that corresponds to one of the control-register settings occurs, the Interrupt Output goes high. The interrupt is reset by reading the Interrupt Status register (hexadecimal 10).

The second interrupt is the Standby Interrupt (active low, pin 14). This interrupt is enabled by writing 01 to the Standby Interrupt register (hexadecimal 16). The interrupt output occurs when there is a match in the comparison between the comparison latch (RAM) and the real-time counter. The interrupt in this case is reset by writing 00 to this same register.



## $ZE\mu S^{TM}$ is a minicomputer AND a microcomputer.

Through multiprocessor technology, each user has a dedicated Z-80A-based single-board microcomputer module, housed in the system mainframe.

But users enjoy minicomputer performance and capacity. Including modular hard disk storage of 34 to 600 megabytes. Tape backup. Shared printers with spooling and queuing. Disk caching. Access to a common database.

Unequalled flexibility and reliability. The completely modular, stackable system can expand to 64 users. To add a user, add only a dumb terminal and an inexpensive user microcomputer module.



#### $ZE\mu S$ sounds powerful. Now prove it.

Name
Company
Address

City/State/Zip

Phone

Trademarks
ZEμS, MUSE: OSM Computer Corporation
Registered trademark:
CP/M: Digital Research

And  $ZE\mu S$  isn't fazed by lightning, voltage variations, or power failures. Power for the entire system is "buffered" through a battery/recharger system that provides up to 20 minutes of operating power.

Unequalled value. MUSE™ multiprocessor operating system is compatible with CP/M®. Minicomputer performance and capacity. New levels of reliability and flexibility. All at a per-user price that is shockingly competitive. If the coupon isn't fast enough, call.

"See us at the NCC in booth #4722"

OSM Computer Corporation 2364 Walsh Avenue Santa Clara, CA 95051 (408) 496-6910 TWX 910-338-2099

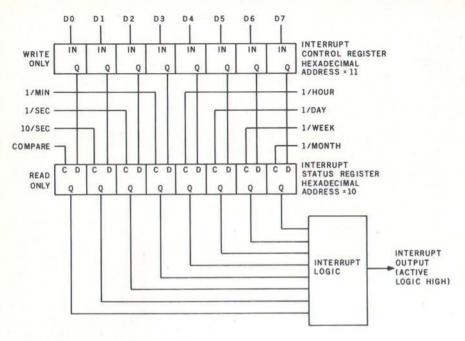


Figure 7: Conceptual diagram of the assignment of bit functions in the Interrupt Control and Interrupt Status registers of the MM58167A.

		_	
Number	Туре	+ 5V	GND
IC1	74LS04	14	7
IC2	74LS30	14	7
IC3	74LS02	14	7
IC4	74LS373	20	10
IC5	MM58167A	see so	hematic

#### Serial-Clock Software

Listing 1 on page 54 is a program written for the BASIC/Debug interpreter of the Z8-BASIC Microcomputer that reads and loads the MM58167A according to commands received from a remote computer over a serial communication link. This software is merely for demonstration and is not indicative of everything you might want in such an intelligent clock.

Because the intelligent clock of figure 6 has its own processor and battery backup, I felt it was unnecessary to include the code for setting the clock initially from the remote computer. For most applications, the clock will have to be set only once.

The subroutines starting at line 1000 allow the clock to be set using an off-line terminal. The program prompts you for entry of the current month, day, hour, etc. It waits after entry for you to issue a start command by pressing the space bar on the keyboard so that the clock can be synchronized with some time reference such as radio station WWV.

# S100 And MULTI-BUS SYSTEMS MADE TO ORDER READY TO GO

A full range of S100, Multi-Bus systems and addons are available directly from stock when you need them. We stock the best hardware from floppys to 20 Mb systems, produced by S-D,

NEC, Intel and other solid manufacturers. Choose from single, multi-user and computer network software.

Write for our Cambridge Micro Systems Catalog.

**PHONES:** open EST Mon.-Thurs. 8:30-7:00, Fri. 8:30-6:00. We also have Hewlett Packard's HP-85 and 87 systems.

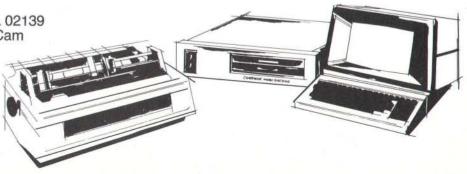
PACKARD



65 Bent Street, Dept. 104 P.O. Box 568, Cambridge, Ma. 02139 TELEX: 921401 Compumart Cam

800-343-5504

In Mass. call 617-491-2700



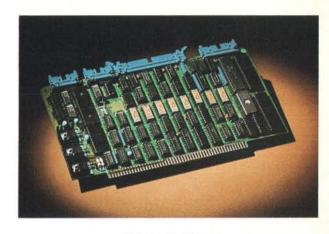
## What Are You Paying . . . For Room And Board?

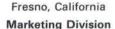
#### TRULY ONE OF A KIND!

THE FIRST AND STILL THE BEST SINGLE-BOARD Z80 COMPUTER. ONLY \$895.00 BUYS YOU THE FOLLOWING FEATURES:

- Z80A CPU
- 4 TIMERS (ZCTC)
- 64K RAM
- 2 SERIAL PORTS (ZSIO)
- 2 PARALLEL PORTS (ZPIO)
- NEC FLOPPY DISK CONTROLLER

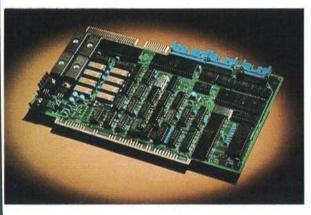
PLUS MORE . . .





21162 Lorain Avenue Fairview Park, Ohio 44126 (216) 331-8500 **TELEX 980131 WDMR** 





#### NETWORKING NECESSITY!

LIGHTNING BUSS TRANSFERS ARE THE HEART OF THIS S-100 SLAVE COMPUTER. COMBINED WITH THESE OTHER GREAT FEATURES YOU HAVE MAINFRAME POWER IN YOUR GRASP.

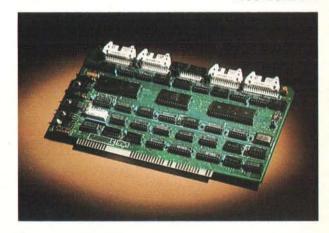
- **Z80A CPU**
- **4 TIMERS**
- 64K RAM
- 2 SERIAL PORTS (ZSIO)
- 4 PARALLEL PORTS (ZPIO)
- ON-BOARD EPROM BURNER

PLUS MORE . . .

#### NEED HIGH SPEED SERIAL I/O PORTS? MPM?

THIS 4 PORT SERIAL I/O CARD PROVIDES EXPANSION FOR YOUR SYSTEM NEEDS. ALSO AVAILABLE WITH SYNCHRONOUS COMMUNICATIONS CAPABILITIES.

- 4 SERIAL PORTS (ZSIO)
- 4 TIMERS (ZCTC)
- 0-880K BITS/SECOND
- **BAUD RATES PROGRAMMABLE 75 TO 19.2K**



OUR BOARDS CAN BE CONFIGURED TO OPERATE WITH THE **FOLLOWING SOFTWARE PRODUCTS:** 

\*MP/M

\*CP/NET

\*\*TURBODOS SINGLE USER OR NETWORKING SPECIAL NETWORKING SOFTWARE

KONAN HARD DISK SUB SYSTEMS

\*REGISTERED TRADE MARK OF DIGITAL RESEARCH CORPORATION.

\*\*REGISTERED TRADE MARK OF SOFTWARE 2000.

Listing 1: A BASIC/Debug program written for the Z8-BASIC Microcomputer and the MM58167A to allow them to function as an intelligent serial time-of-day clock.

```
100 REM Serial Controlled Real Time Clock
110 Rem
130 a=%b807:b=%b806:c=%b805:d=%b804:e=%b803:f=%b802
140 1=@240
142 if 1=161 then 148
143 gosub 600
144 goto 140
148 1=@240
150 if 1=137 then 300
152 if 1=146 then 200
154 if 1=147 then 1000
156 if 1=148 then 1300
158 if 1=149 then 500
170 goto 148
200 Rem Reset Interrupt
205 m=@%b810
210 goto 140
300 Rem Set interrupt control register
310 input n : @%b811=n
330 goto 140
500 Rem Read Interrupt Status Register
510 print hex (0%b810)
520 goto 140
600 Rem Check Interrupt Line
605 p=@%C000
610 if AND(p, 880) = 0 then 140
620 print "I"
630 goto 200
1000 Rem Time Set Subroutine
1005 "Enter date. Preceed entries with %"
1010 "Month (1-12) ";:input g
1020 "Day of the month (1-31) ";:input h
1030 "Day of the week (1-7) ";:input i
1040 "Hour (1-24) ";:input j
1050 "Minute (0-59) ";:input k
1060 "Press SPACE to start clock"
1070 if @240=160 then 1090
1080 goto 1070
1090 @a=g:@b=h:@c=i:@d=j:@e=k
1100 goto 1200
1200 REM print full time parameters
1210 goto 1220+@c
1221 "Sunday ";:goto 1250
1222 "Monday ";:goto 1250
1223 "Tuesday ";:goto 1250
1224 "Wednesday ";:goto 1250
1225 "Thursday ";:goto 1250
1226 "Friday ";:goto 1250
1227 "Saturday ";:goto 1250
1250 if @a>9 then goto 1259+@a-6
1255 goto 1259+@a
1259 goto 1260
1260 "
        January
                 ";:goto 1280
1261 "
        February ";:goto 1280
               ";:goto 1280
1262 "
        March
```



# Introducing a direct line to a 60 MHz Tektronix scope built for your bench!

From the world's most respected name in oscilloscopes: a new scope, plus a new direct order number, that finally makes it practical to put Tektronix quality on your bench...at work or home.

Among professional engineers and technicians there is no substitute for the performance and reliability of Tektronix oscilloscopes.

Now, for the first time, Tektronix is offering an advanced scope at an unprecedented low price and has a direct order line that lets you get your order processed today!

The scope: the 2213. Its radical new design brings you Tektronix quality for well below what you would pay for

#### lesser-name scopes.

The 2213's practical design includes 65% fewer mechanical parts, fewer circuit boards, electrical connectors and cabling. Result: a lower price for you plus far greater reliability.

Yet performance is pure Tektronix: there's 60 MHz bandwidth for digital and high-speed analog circuits. The sensitivity for low signal measurements. The sweep speeds for fast logic families. A complete trigger system for digital, analog or video waveforms. And new high-performance Tektronix probes are included!

#### 2213 PERFORMANCE DATA

**Bandwidth:** Two channels, dc—60 MHz from 10 V/div to 20 mV/div. (50 MHz from

2 mV/div to 10 mV/div).

Sweep speeds: Sweeps from 0.5 s to 50 ns (to 5 ns/div with X10 mag).

**Sensitivity:** Scale factors from 100 V/div (10X probe) to 2 mV/div (1X probe). Accurate to  $\pm$  3%. Ac or dc coupling.

**Delayed sweep measurements:** Standard sweep, intensified after delay, and delayed.

(Need dual time-base performance and timing accuracy to ± 1.5%? Ask about our 2215 priced at \$1400.)

Complete trigger system: Modes include TV field, normal, vertical mode, and automatic; internal, external, and line sources; vari-

Probes: High perform-

able holdoff.

ance, positive attachment, 10-14 pF and 60 MHz at the probe tip.

The price: Just \$1100 complete\*. Order direct from Tektronix National Marketing Center. Phones are staffed by technical people to answer your questions about the 2213. Your direct order includes a 15-day return policy and full Tektronix warranty.

Now it's easier than ever to get your hands on a Tek scope!

ORDER TOLL-FREE

800-547-1845

Ask for Department A03

(In Oregon, Alaska and Hawaii: 1-503-627-5402 collect.) Lines are open from 8 am EST to 5 pm PST.

\*Price F.O.B., Beaverton, OR.



```
1263 "
        April
               ";:goto 1280
        May ";:goto 1280
1264
1265 "
              ":goto 1280
        June
1266 "
        July
              "::goto 1280
1267 "
                ";:goto 1280
        August
1268 "
                    ";:goto 1280
        September
1269 "
                 ";:goto 1280
        October
1270 "
                  ";:goto 1280
        November
1271
        December ";:goto 1280
1280 print Hex(@b)
1290 print hex(@d); " HOURS "; hex(@e); " MINUTES "; hex(@f); " SECONDS"
1295 goto 140
1300 print hex(@d);":";hex(@e);":";hex(@f)
1310 goto 140
```

## For The Best In Price, Selection and Delivery,

## Now T

n VA. Call Collect 703-237-8695

AMPEX • INTERTEC • TEXAS INSTRUMENTS • GENERAL DATA COMM. • ANDERSON JACOBSON • C. ITOH • QUME • BEEHIVE • DATASOUTH • DIABLO • CENTRONICS • NEC • PRENTICE

#### SUPERBRAIN MICROS

INTERTEC: 64K DDONLY \$26	38
64K QD ONLY \$294 DDS-10 Meg	48
(Hard Disk)ONLY \$319	95
PRINTERS	
DATASOUTH: Ca	all
NEC:	
7710 \$219	96
7715 Call for Special Price	ce
7730	96
7720 Call for Special Price	
7725 Call for Special Price	ce
Std. Forms Tractor \$ 20	00
3510	
DIABLO:	
630-R102 RO \$199	)5
QUME:	
Sprint 5, 55RO \$233	39
Sprint 5, 55KSR	
Sprint 9, 45RO,	
Limited Panel \$184	15
Full Panel\$196	
Std. Forms Tractor \$ 19	

Bi-Dir. Forms Tractor . . . . \$ 199

#### CENTRONICS:

739-1	(Parallel) \$ 649
739-3	(Serial) Call for Special Price

#### TERMINALS

AM	Ю	_	Y	
WIA.		_	n	

Dialogue 30
Dialogue 80 \$ 939
BEEHIVE: (SMART DISPLAY)
DM5
DM5A \$ 930
DM310 (3101 Emulator) \$1095
NOTE: IBM and Burroughs compatible terminals available. Please inquire.  C. ITOH
CIT 101 \$1350
TEXAS INSTRUMENTS:
745 Standard \$1390
910 Pagio \$1240

## 810 Package . . . . . . . . . . . \$1439

820 Package RO Package . \$1610 820 RSR Package . . . . . . Call 840 RO Basic . . . . . . . . . \$ 795

#### 840 RO Tractor Feed Pkg. .\$1059 COUPLERS

### Special! While They Last!

#### SOROC TERMINALS

IQ 120	<b>ONLY \$625</b>	\$ 675
IQ 130	<b>ONLY \$525</b>	\$ 573
IQ 135	<b>ONLY \$659</b>	\$ 709
IQ 140	<b>ONLY \$989</b>	\$1069

#### DISC DRIVES

#### QUME:

Data Trak 5 . . . \$325 or 2 for \$599 Data Trak 8 . . \$549 or 2 for \$1049

#### SOFTWARE

BISYNC-80 RJE \$	769
Wordstar \$	319
Data Star	215
Cobol \$	789
Forms 2 (Cobol Gen.) \$	179
Mail Merge\$	
Spell Guard\$	229
Plan 80	249
Super Calc \$	249
Milestone \$	249

In addition, we can make EIA RS232 or RS449 cables to your order, and supply you with ribbons, printer stands, print wheels, thimbles for all printers listed. And many, many more items. CALL NOW.

Add 2% for shipping and insurance. Superbrain shipped freight collect. VISA and MasterCards welcomed; add 3% for credit card purchases Virginia residents, add 4% Sales Tax. For fastest delivery, send certified check, money order or bank-wire transfer. Sorry, no C.O.D. orders. All equipment is in factory cartons with manufac-turers' warranty. Prices subject to change without notice. Most items are in stock now.





Terminals Terrific, Incorporated, P.O. Box 1625, Merrifield, VA 22116, 800-368-3404 (In VA, Call Collect 703-237-8695).



We finish first because we are faster, offer nigher quality peripherals and can expand our system significantly beyond our nearest competitors. In fact, looking at the chart pelow, you can quickly see why knowledgeable resellers are choosing IBC.

	IBC	OURX	ΔΙΞΟΣ
Oasis Operating System (Max. Users)	9	5	4
CPU Speed (MHz)	6	4	4
Disk Speed I/O (MB/Sec.)	.81	65	.54
Seek (Milli Sec.)	35	50	65
Cache Disk Memory	Yes	No	No

Circle 198 on inquiry card.

Join us in the winners circle with high performance equipment and the best dealer plan in the industry. Call or write:

OUTSIDE THE USA

TBC/Integrated Business Computers

21592 Marilla Street Chalsworth, CA 91311 (213) 882-9007 TELEX NO. 215349 WITHIN THE USA

#### ISC DISTRIBUTION

4185 Harrison Blvd., Suite 301 Ogden, UTAH 84403 (801) 621-2294 Indicates command-sequence initiation (all control commands must be preced-

ed by "!").

Control-I Set Interrupt Control register. Clock responds with "?". Remote computer sends "%X" and a carriage return (X is the BCD value computed according to figure 7). Each time the interrupt is triggered by a counter rollover, the clock will send "!!" and a carriage return to the remote computer.

will send "I" and a carriage return to the remote computer.

Control-R Reset Interrupt Output.

Control-S Set complete time parameters. This is the manual preset mode and is most

easily set using a terminal off line as previously described.

Control-T Send short time. Clock responds with hours, minutes, and seconds as

"10:25:35" plus a carriage return.

Control-U Read Interrupt Status register. Clock responds with the value stored in the In-

terrupt Status register. Reading this register resets the Interrupt Output.

**Table 3:** Command codes used by the BASIC/Debug code in listing 1 to control the real-time-clock circuit of figure 6 from a remote computer. These codes were arbitrarily chosen and do not provide for activating all the capabilities of the MM58167A.

The serial communication of time information to the remote computer is commanded by various control codes. Only the minimal required information is transmitted from the intelligent clock so that the information can be more easily used in an application program on the remote machine. A simple response to a time query of "06:34" reduces processor data

manipulation in the intelligent clock. The control codes I chose (arbitrarily) are listed in table 3.

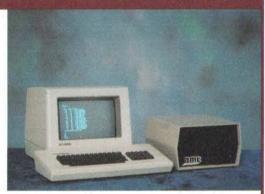
My brief demonstration does not include setting the Standby Interrupt. It should be added for any serious use. Also, because this intelligent clock contains a versatile microcomputer, it can be programmed for any data rate or custom data format.

## **ADD A 5 MBYTE WINCHESTER**

TO YOUR COMPUTER ARSENAL FOR \$2995.00

#### **INTERFACES WITH:**

- S-100 BUS (CP/M)
- Heath H89, H90 (CP/M, HDOS)
- Zenith Z89, Z90 (CP/M, HDOS)
- TRS 80 Model III (CP/M, TRS DOS)
- Xerox 820 (CP/M)
- IBM Personal Computer (CP/M 86, IBMDOS)



AMT's EZ8X5 is a complete, ready to plug in Winchester Hard Disk Subsystem. Featuring easy implementation, enhanced system interface cards, an extensive disk test package. The EZ-8X5 delivers a full 5, 10, or 20 megabytes. Dealer and Distributor inquiries are being accepted.



Route 30 West Greengate Professional Building Greensburg, PA. 15601 412/837-7255

or call Toll Free 1-800/245-6908

. It's What's Inside That Counts.

#### In Conclusion

Technology has come a long way from the days when real-time clocks were based on a heartbeat interrupt clocked from the power line. The MM58167A real-time clock is a well-thought-out design which truly meets the market demand. Applications that once demanded expensive hardware/software solutions are now satisfied by low-cost LSI hardware.

National Semiconductor has long had the reputation of being a leader in semiconductor innovation, and I believe the company has justified that reputation with the MM58167A.

#### Next Month:

The high technology of videoimage storage has been promising to benefit the computer industry. In June, I'll let you in on how to reap this benefit with a computer controller for the Pioneer VP-1000 Laserdisc video player.

References

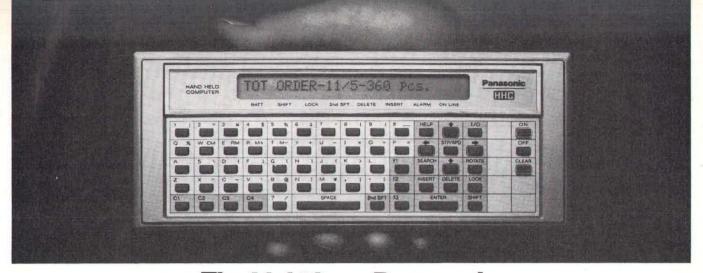
 Ciarcia, Steve. "Anyone Know the Real Time?", August 1979 BYTE, page 50. Reprinted in Ciarcia's Circuit Cellar, Volume II. Peterborough, NH: BYTE Books, 1981, page 96.

 Ciarcia, Steve. "Build a Z8-Based Control Computer with BASIC, Part 1," July 1981 BYTE, page 38. Reprinted in Ciarcia's Circuit Cellar, Volume III. Peterborough, NH: BYTE Books, 1982, page 146.

 Ciarcia, Steve. "Build a Z8-Based Control Computer with BASIC, Part 2," August 1981 BYTE, page 50. Reprinted in Ciarcia's Circuit Cellar, Volume III, page 156

Editor's Note: Steve often refers to previous Circuit Cellar articles as reference material for each month's current article. Most of these past articles are available in reprint books from BYTE Books, 70 Main St., Peterborough, NH 03458. Ciarcia Circuit Cellar, Volume I, covers articles that appeared in BYTE from September 1977 through November 1978. Ciarcia's Circuit Cellar, Volume II, contains articles from December 1978 through June 1980. Ciarcia's Circuit Cellar, Volume III, contains the articles that were published from July 1980 through December 1981.

To receive a complete list of Ciarcia's Circuit Cellar project kits available from the Micromint, circle 100 on the reader-service inquiry card at the back of the magazine.



## The Link from Panasonic. The portable computer that lets your customers take the advantages of an office computer anywhere they go.

The Link. It's the next major business tool because it's a full-logic computer that's fully portable.



Exchange information with other computers with the telephone modem.

By itself, it can perform a wide shipments, enter orders, make variety of sophisticated computer functions because it can store 4K bytes of information. Equally important, it can link you to the information and brainpower of your main office computer wherever you go. You can program in Microsoft Basic.® Yet it's easy to operate, even if you've never worked with a computer before.

Imagine. Using just The Link, anyone in the field, the plant or on the sales floor—like salesmen. managers, engineers or retailers can now answer questions that used to mean a trip back to the office. A sales engineer, for example, types data into The Link and gets detailed product information and specs on the spot.

And The Link is part of an entire computer system: By adding different optional components, you can create whatever kind of computer you need. Wherever you need it.

By adding the telephone modem, for example, a salesman can put his company's main office computer or a data bank

to work for him from any telephone booth. He can check credit ratings and inventory, trace

bids and estimates, and much more. So The Link can make him and his office computer much more productive.

By adding the microprinter, the salesman gets hard copies of information right on the spot - an instant record of his transactions.

By adding the TV adapter, he can display information and 8-color charts on any color TV



Display information and charts with the TV adapter. screen. So he can use data from his office computer to develop a sales presentation in a motel room. And show it on a client's video monitor the next day.

If the salesman needs to work with a bigger program and more memory, other optional components increase The Link's capacity to 52K RAM plus 64K ROM. That's more than many desktop computers.

The Link measures only 9" x 4", weighs only 21 ounces.



Take The Link and all its components anywhere in its slim attache case.

and runs on AC or rechargeable batteries.

And it costs only \$600.00.\* That's amazingly small when you realize the big change it could make in the way you do business.

Panasonio	R INQUIRIES II Company, Porta sonic Way, Seca	able Computers
NAME		
TITLE	PLEASE PR	
COMPANY.		
TYPE OF B	USINESS	
ADDRESS		
CITY	STATE	ZIP
PHONE NU	JMBER	

The Link. It will change the way the world uses computers.



## Six Personal Computers from Japan

A comparative review of the BMC if800, the Canon CX-1, the Hitachi MB-6890, the NEC PC-8001A, the Fujitsu FM-8, and the Systems Formulate Corporation Bubcom80

Do you want a Japanese computer? Before you answer too hastily, think back a few years.

The trend setters who bought Toyota automobiles when they first appeared in the United States in the late 1960s got a great deal of bemused attention from their neighbors. The neighbors maundered about spare parts, Detroit styling, and horse-power, but the Toyota owners just smiled. They knew they were getting a low-cost car that was reliable and met their needs at a time when the domestic companies did not care to address that particular set of needs.

Today, of course, American motorists rush to buy Japanese cars while Detroit automakers, scratching their heads and wondering what went wrong, scramble to imitate the virtues of the Japanese imports. And in other industries in which Americans have heretofore led the world, pundits and xenophobes alike are stridently warning, "The Japanese'll getcha if ya don't watch out!" Many steel companies and electronics firms are beginning to feel the uncomfortable heat of Japanese competition.

Christopher P. Kocher 4233 Baltimore Ave. Philadelphia, PA 19104

Michael Keith D-46 Abbington Dr. Hightstown, NJ 08520

What about personal computers? A few Japanese firms have started selling "Americanized" versions of their computers, and a few others plan to start. Will the Japanese take over again?

Our crystal ball is no better than anyone else's, but we would like to help you decide for yourself. In this article, we evaluate and compare six Japanese personal computers: the BMC if800, the Canon CX-1, the Fujitsu FM-8, the Hitachi MB-6890, the NEC PC-8001A, and the Systems Formulate Corporation Bubcom80. Some of them are already being sold here; some are in the process of being adapted for the American market; and some may never be sold here.

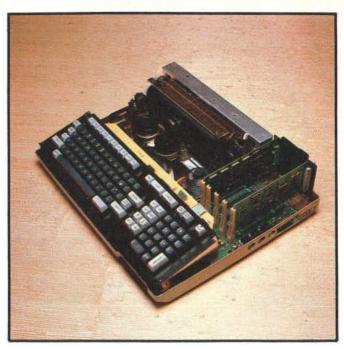
Of course, there is no one best computer, just as there is no single typical computer user. Each computer represents a design team's attempt to assemble a set of features that will appeal to a variety of users. How you rank a computer depends very much on what you plan to do with it. We will try to give as complete a picture of each machine as we can; you must supply the ranking.

Since the computers examined here are in various stages of adaptation, it would not be fair to rate the documentation of all the machines on the same scale. While some machines came with complete instruction manuals in English, others came with instructions written only in Japanese or with what were obviously first drafts of translations.

Moreover, since we had a limited time in which to examine a large number of very complicated machines, we had to concentrate on what is most salient: features that are conspicuously excellent, egregiously awful, or strikingly unique. We undoubtedly missed many subtleties of each machine. If this gives a misleading picture of any computer, we apologize.



Photo 1: The BMC if800 computer. Shown here is the basic machine consisting of a keyboard/processor module, two floppy-disk drives, a color video monitor, and a unique built-in printer. Notice the 10 "super-function" keys along the bottom of the display screen. These are fully programmable function keys that can be used for menu selection or other forms of interaction in programs.



**Photo 2:** Inside the keyboard unit of the if800. The built-in printer mechanism is clearly visible. The printer can operate as either friction-feed or tractor-feed, and produces a high-quality dot-matrix output.

Photographs accompanying this article, except photo 6, were taken by Paul Avis, photographer, and Pauline Elkin, stylist.

## BMC if800

The prize for the most computer in the smallest package goes to the if800 Model 20 computer, manufactured by the Oki Electric Company of Japan. But since it is marketed in this country by BMC Computer Corporation (which has its office in Carson, California—the abbreviation stands for Business Machines Corporation), we refer to it as a BMC product to avoid confusion. Although it is billed as a personal computer, it will receive much consideration as a small-business computer because it has highresolution color graphics, support for Digital Research's CP/M operating system, a built-in printer and floppydisk drives, and a very high-level BASIC language all as standard equipment.

#### Hardware Overview

The basic if800, shown in photo 1, consists of two pieces, one mounted above the other. One module contains the processor circuitry, the keyboard, and the printer; the other module contains the video-display screen and two 5½-inch floppy-disk drives. The two modules are connected by two cables, one for the monitor and one for the disk drives. The combined system is sufficiently compact to fit well on even the most crowded table.

#### Keyboard

The 98-key keyboard is very solid and has a nice typing feel. In addition to tactile feedback, you receive audio feedback with every key depression in the form of a faint click from the speaker under the keyboard. If a key is held down for more than a second, it automatically repeats the typing of its character, along with audio feedback.

The 98 keys are separated into several groups: a typewriter-key-board section, 10 program-assignable function keys, 8 editing keys, a numeric keypad, and several special keys. The special keys include keys for setting tabs, a CAN (cancel) key (which erases the line currently being typed), and three keys for controlling the printer. The typewriter section also has a GRAPH key (for accessing a set of special graphics characters, such as card symbols and line-drawing characters) and a COMD

#### At a Glance

Name

BMC if800 (Model 20)

Distributor

**BMC** Computer Corporation 860 East Walnut St. Carson, CA 90746 (213) 323-2600

Dimensions (inches) 19% by 20 by 26%

Microprocessor Z80. 8-bit

Size of User Memory 64K bytes

Number of Keys

Number of Function Keys

#### **Bullt-In Hardware**

Dot-matrix printer; two 51/4-inch floppydisk drives; color video monitor

#### Standard Interfaces

RS-232C (DB-25); light pen; monochrome video monitor; RGB color monitor; audiocassette tape

Optional Interfaces

8-inch floppy-disk drives; parallel I/O port; IEEE-488 bus: A/D, D/A converters

**Expansion Sockets** 

**Character Sets** Roman, katakana, graphics

Graphics/Color Resolution 640 by 200

Number of Colors

Other Features Time-of-day clock with battery; speaker with music sublanguage

\$7950 (whole system)

key that allows single-keystroke access to various BASIC keywords.

When the PRINT key is depressed, everything that appears on the display screen is printed by the builtin printer. A small LED (lightemitting diode) on the keytop indicates whether the computer is in print mode. For example, to get a program listing, merely hit the

PRINT key, type LIST, and hit RETURN, and you have instant hard copy. A separate HARD COPY key can be used to dump the current screen image (text and/or graphics) to the printer.

It also has a KANA key, which the manual says allows access to Japanese katakana characters. However, in the American unit, the key has been disabled with a metal spacer. (See the text box "Japanese Character Sets.")

#### **Built-in Printer**

The if800's self-contained printer is conveniently placed behind the keyboard so that the paper comes out in the same direction as it does in an ordinary typewriter. The dot-matrix printer uses a wire-impact mechanism and a regular typewriter ribbon, and has both friction- and tractor-feed mechanisms. Its printing speed is 80 cps (characters per second), and the print quality is excellent (almost good enough to conceal the dot-matrix printing method). The only shortcoming we noticed is that in dumping a screen image (as opposed to regular character-by-character text printing) the scan lines are spread quite far apart in the printed image, making text or detailed graphics difficult to read. We hope this is only a software limitation.

#### What's Inside?

Photo 2 gives an inside view of the keyboard/processor module, where various components of the computer are visible. The cover lifts off easily for access to the insides. The keyboard sits on top of the main printedcircuit board, which contains the microprocessor (a Z80A running at 4 megahertz [MHz]), memory, and support circuitry, as well as a small speaker for audio output. The keyboard assembly is all metal, providing a degree of electromagnetic shielding for the main circuit board.

Also inside the case is a real-timeclock chip that can be read by software. We were surprised at one feature of the time-of-day clock: the first time we plugged in the if800 and ran

### Japanese Character Sets

Japanese, unlike most languages, has four separate writing systems, and it is not unusual to see all of them on one page.

Kanji characters are pictographs taken from Chinese. One character represents one word or concept. Kanji characters are used to represent roots of nouns or verbs.

The hiragana and katakana systems are syllabaries in which one character represents one consonantvowel pair. Hiragana characters, full of graceful but tiny curlicues, are considered easier to read and are used in most text to indicate inflectional endings and to spell out words that are uniquely Japanese. Katakana characters represent exactly the same syllables as the hiragana but are more angular. They are used for children's books, official documents, and transliterating foreign words, especially foreign technical terms.

The Roman alphabet is used for such things as computer commands. in large part due to the ubiquity of Western computer-language systems.

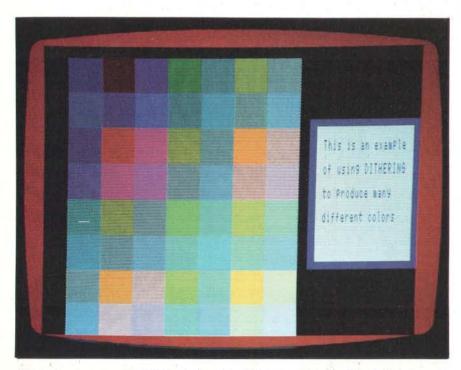
Most of the Japanese personal computers reviewed here offer a Roman-alphabet keyboard with some sort of locking shift key that allows the same keys to be used for katakana as well. Generally, a few very common kanji characters are thrown in as graphics keys (the pictographs for "date" and "time," for example), but the hiragana characters require resolution beyond the capability of most noninterlaced video displays.

If you think about it, the Japanese character sets might explain much of the feverish technological development in certain segments of the Japanese electronics industry—like the work on very dense read-only memories. The Japanese require great amounts of memory just in character generators to form the complex kanji characters.

Japanese Computers



**Photo 3:** A sample display from the if800, illustrating some of the graphics primitive operators. Most of the picture was produced using LINE commands to draw polygonal outlines followed by PAINT commands to fill the polygons.



**Photo 4:** An example of "dithering" on the if800. Even though only eight colors are available, by juxtaposing dots of different colors in different combinations, many different, apparently solid, colors can be displayed. This technique can also be used on the Fujitsu and Bubcom computers.

one of the demonstration programs, the system showed the correct time! A little hunting inside the unit revealed a nickel-cadmium battery that keeps the clock chip going when the computer is unplugged or turned off.

#### Connecting to the World

Near the rear of the keyboard/processor module are five slots for peripheral-device-controller circuit cards. Two of these slots are occupied by controller cards for the color video display and the two floppy-disk drives. Many other optional interfaces are available, including a controller for 8-inch floppy-disk drives, a Centronics-compatible parallel printer port, an IEEE-488 interface (an Institute of Electrical and Electronics Engineers standard connection scheme), A/D (analog-to-digital) and D/A (digital-to-analog) converters, and additional RS-232C serial I/O (input/output) ports.

The keyboard/processor module has other switches and connection points. Built into its right side are a DB-25S connector for RS-232C serial communication and DIN (Deutsche Industrie Norm) connectors for a light pen, a black-and-white composite-video monitor, and an audio-cassette recorder. On the left side are two push-button switches that reset the system. The first button, labeled IPL (Initial Program Loader), is a "hard" reset that restarts the system in its power-up state, whereas the second button, NMI (Non-Maskable Interrupt), is a "soft" reset that returns you to the BASIC or CP/M command level (if possible). The NMI button is useful for aborting execution of a program in an infinite loop or some other "hung" state (when Control-C may not work).

#### Display Module

The top module of the if800 houses the standard color video monitor, which provides a high-resolution (640 dots horizontally by 200 dots vertically) eight-color display. Characters can be displayed in two sizes and in various screen formats (80 or 40 characters by 20 or 25 rows).

A unique feature of the if800 is the group of 10 "super-function" keys that are located on the video-monitor module, just below the display screen. These 10 keys duplicate the functions of the 10 function keys on the keyboard. Thus, they can be used under program control to produce any desired response. Their location makes it easy for an inexperienced user to select an item from a menu simply by pressing the function key just below the item shown on the screen. This would be especially useful in combination with a light pen because a program could be written that never required you to type on the main keyboard. You would just have to use the super-function keys.

Just to the right of the display screen are the two 51/4-inch two-sided double-density floppy-disk drives. Each floppy disk can store 280k (280,000) bytes.

#### Overview of Software

The two major software packages that came with our if800 computer were Oki BASIC, a Microsoft product, and a version of the CP/M operating system. In addition, several demonstration programs that run under each were provided.

Oki BASIC is a very high-level implementation of the BASIC language that fully exploits the hardware of the if800. For example, many of the special functions on the keyboard (such as TAB, DEL [delete], CAN, and the function keys) are supported, as well as the COMD key, which allows single-keystroke typing of commonly used BASIC commands. Most of the peripheral devices can be directly controlled from BASIC, including both disk drives, the printer, the onboard speaker, the light pen, the clock and calendar, and RS-232C

Each peripheral device is supported by a whole array of BASIC keywords. An example of a devicecontrol keyword is ON COM GOSUB, which allows a program to be interrupted by data arriving at the RS-232C port. A subroutine call is performed when a signal is detected

on the port. This in effect allows for interrupt processing-usually reserved for assembly-language programmers-entirely within BASIC.

#### Displaying Graphics

Because the if800 contains a highresolution color display, you might expect good graphics support from BASIC. We were not disappointed; many high-level keywords are available for manipulating the graphics screen. Primitive operators for drawing are available for creating images, including CIRCLE, LINE (which includes the capability of drawing rectangles), and POINT. In addition, a graphics macroinstruction facility called GML (Graphics Macro Lan-

Each computer represents a design team's attempt to assemble a set of features that will appeal to a variety of users.

guage) is built into Oki BASIC. This is used by defining a BASIC character string consisting of GML commands, which appear mostly as a single letter followed by a single numeral. Typical GML commands are:

Un-Move cursor up n pixels (there are corresponding commands for other directions)

Cn-Set color to n Sn-Set scale factor to n Xstring-Execute a previously defined GML string

To execute a GML command, the statement DRAW string or stringvariable is issued. One GML string can call another GML string, thus providing a nested-macro facility. Consequently, small detailed objects (such as game pieces or special symbols) can be compactly described and drawn with a single command.

Another facility for describing detailed graphics images is the DEF CHR\$ statement in BASIC, which redefines any of the characters in the character set. Note, however, that characters can be only two colors (foreground and background), whereas GML commands can draw images with multiple colors.

Another interesting BASIC keyword is PAINT. A PAINT statement fills in the area starting at specified Cartesian coordinates and bounded by a specified border color with a specified fill color. The area boundary can be any complex shape bounded by any color (which need not be the same as the drawing color). If the boundary is very large and complex, an OUT OF MEMORY error may result, since a recursive algorithm utilizing a stack is used to process a PAINT command. This command, combined with the geometric commands, can be used to easily create graphics displays using filled polygons. A sample picture drawn by one of the authors is shown in photo 3. This was drawn entirely by a small BASIC program (containing a lot of DATA statements!).

The high horizontal resolution (640 dots across) allows use of a standard trick in computer graphics that can effectively provide many more than eight colors. This technique is called dithering and depends on the following effect: if we draw a horizontal line consisting of alternating blue and red pixels, our eyes will area-average the pixels and perceive the line as a solid line of a color somewhere between blue and red. By using different combinations and mixtures of the eight available colors, a whole array of different, apparently solid, colors can be displayed. Photo 4 shows a display created using this technique. Unfortunately, the BASIC PAINT keyword does not support filling with dither patterns, but someone will eventually write such a routine for the if800. Even more impressive graphics will then be possible.

The eight-color display can be thought of as three overlaid planes of red, green, and blue pixels. It is possi-

## Japanese Computers-

ble in software to choose whether one or several of these planes are to be displayed at any time. This could be used, for example, to allow superimposing a grid over an image in an architectural application program. The grid could be instantly displayed or removed at the touch of a key.

#### **Musical Possibilities**

A set of commands is also available for making single-voice musical melodies through the onboard speaker. Another sublanguage called MML (Music Macro Language) is used. A BASIC string is defined containing MML commands, which include commands for specifying pitches, octaves, timbres, and rests. To play the melody, the statement PLAY string is executed.

#### Minor Gripes

We noted only a few minor problems with the if800. When programming in BASIC, the keyboard produces uppercase letters in the normal mode. To get lowercase letters, the SHIFT key must be used. There is no shift-lock or lowercase-lock key, and there does not seem to be any way to reverse this behavior to the behavior most people expect (no shift=lowercase, shift=uppercase). This is fine for most programming, but if you have to type a lot of text (for example, in entering program instructions into the source file), it becomes annoving. The lowercase characters that have descenders are somewhat inelegant, as well; this is because of the small character matrix (8 by 8 dots).

#### Other Observations

In addition to Oki BASIC, we tested a 64K-byte version of CP/M. Since CP/M is widely known, we shall mention only a few unique features of the BMC version. First, a library of graphics routines that can be called from Microsoft's MBASIC is available. This allows utilizing most of the Oki BASIC graphics primitives (LINE, CIRCLE, PAINT, etc., but not GML commands) from MBASIC. In

fact, the CP/M graphics library seems to execute these commands slightly faster than Oki BASIC.

A version of Wordstar, the popular word processor from Micropro International, was also supplied. Overall it works quite well, with most of the special features (such as boldface, underlining, and text justification) supported by the if800's built-in printer. Features not supported include multiple text sizes and proportional spacing, since the if800 printer cannot perform these functions. Also of interest is the fact that Micropro is said to be working on a color version for the if800, which will utilize the color capability of the video display.



**Photo 5:** The Canon CX-1 computer. All the parts of the basic machine (keyboard, processor, two disk drives, and green video-display screen) are contained within a single molded plastic case.

## Canon CX-1

The CX-1 computer is being presented in the marketplace mainly as a business computer, partly because of its one-piece construction and its monochrome green display screen, which make it quite at home in an office setting. The documentation is well suited for use by inexperienced office workers. It is being marketed in this country by Canon U.S.A. Inc., which has its main office in Lake Success, New York.

#### Hardware Overview

The basic parts of the CX-1 computer—the keyboard, processor, memory, video display, and two floppy-disk drives—are housed in a single cabinet measuring 53 by 64 by 33 cm (21 by 25 by 13 inches), shown in photo 5. This single-piece design has both advantages and disadvantages. An advantage is that there are no connecting cables to break or wear out. A disadvantage is that the unit

takes up a lot of desk space and is guite heavy; it weighs 25 kg (55 pounds).

#### **Keyboard Characteristics**

The CX-1's keyboard has 84 keys. In addition to the normal typewriter keys, it includes a numeric keypad, several command keys (SHIFT LOCK, UC, CTRL [Control], CAN, and ESC [Escape]), several editing kevs (four cursor-control arrows, HOME, INS [insert], and DEL), two mode-select keys (PROG and OPE), and a HLT (halt) key.

Among the command keys are both a SHIFT LOCK key (which acts like a typewriter shift lock in that both alphabetic and numeric/symbol keys are locked in the shifted position) and a UC key (for "uppercase," which shift-locks only the alphabetic keys). The unfamiliar mode-select keys are used when programming in BASIC to switch between programming and operating modes (this will be explained later).

The HLT key is used to put the computer into a "pause" state. The computer will suspend whatever it is doing and display a special prompt character to show that it is in the pause state. You can then either continue or abort the current process. If this is done during execution of a BASIC program, variables can be examined in the pause state. This is very useful for debugging programs.

Another unfamiliar key is the large one labeled START on the right side of the keyboard. This key usually seems to work just like the RETURN key. It is labeled START because of the feature of Canon's BASIC interpreter that allows you to run a program by just hitting START in the "OPE" mode (rather than having to type "RUN" and then hit the RETURN key).

One notable omission from the keyboard is a REPEAT key (or a provision for automatic repetition of characters from all the keys). This is especially annoying when you are using the cursor-movement keys, as in editing; you have to keep jabbing away at the keyboard to keep the cursor moving. A REPEAT key would eliminate much of this tedium.

#### Other Hardware Features

The 12-inch green monochrome video-display screen sits over the keyboard. The display format is 24 rows

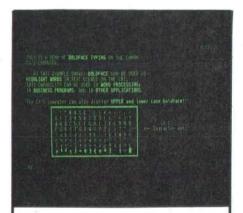


Photo 6: The CX-1 display, showing the dual-intensity (or "boldface") capability. Characters can be displayed in two different intensities on the CRT (cathode-ray tube). Also, notice the clock display in the upper right-hand corner. This display (which can be either real time or elapsed time from some event) is automatically refreshed every second by the operating system. Photo by the authors.

of 80 characters, and the overall display quality is excellent. One rare feature of the CX-1 is its ability to display characters on the screen in two different levels of brightness (sort of an electronic boldface). Photo 6 shows an example of this dualintensity display, along with the complete character set. The CX-1 is an entirely character-oriented machine; these characters are all that can be displayed on the screen. There are no user-definable characters or any mechanism for displaying bit-mapped graphics.

A unique feature of the CX-1 is a constant display of the time from the internal time-of-day clock; this always appears in the upper righthand corner of the video screen.

To the right of the screen are two 51/4-inch floppy-disk drives. Each one has a capacity of 320k bytes per disk. The operating system has a software door-lock function that prevents an absentminded user from opening the drive doors when the read/write head is engaged.

In the rear of the case are jacks for two optional additional disk drives, an optional light pen, three RS-232C serial ports, and three Centronicscompatible parallel ports.

#### Software: Operating System

The Canon computer is built around an 8-bit 6809 microprocessor and runs an operating system called MCX ("Monitor program for CX-1"), which is both powerful and unconventional. It is a very "modeoriented" system; that is, you perceive the system as operating in various modes, each identified by a different prompt character. Operating modes, and their prompt characters, include:

- 0>MCX command mode
- \$ BASIC operating mode
- % BASIC programming mode
- @ Pause mode
  - Editor

You can switch modes by various commands or keystrokes. Commands are not always obvious or consistent. however. For example, to switch from BASIC programming mode to operating mode, you must press the OPE key (whereupon a small LED on the OPE key lights up). To switch back, however, you must press PROG and then hit the RETURN key.

Another unconventional characteristic of the MCX operating system is that all user typing appears on the bottom two lines of the screen. Therefore it has no screen editing, and even the method of entering and editing a BASIC program takes some getting used to. When a BASIC statement is entered, it first appears on the twenty-third line of the screen, near the bottom. When the RETURN key is typed, the statement jumps to the

#### At a Glance

Name

Canon CX-1

Distributor

Canon U.S.A. Inc. One Canon Plaza Lake Success, NY 11042 (516) 488-6700

Dimensions (inches)

13 by 20% by 25%

Microprocessor 6809, 8-bit

Size of User Memory 64K bytes

Number of Keys 84

Number of Function Keys
0

Standard Interfaces

Light pen; RS-232C (DB-25); printer; more disks

Expansion Sockets

**Character Sets** 

Roman, graphics, boldface

Graphics/Color Resolution
None

Number of Colors

2

Other Features
Alphanumeric line labels; other FORTRANlike features in BASIC

Price

\$4995 (whole system)

main part of the display and reappears at the correct place in the program. Similarly, to change a BASIC statement, you must first pull it down to the twenty-third line (via an editing command), edit it, and then reinsert it into the program.

MCX acts like CP/M in that when it encounters an unrecognized command, it searches the disk to try to find a BASIC or command file by that name to execute. The MCX operating system seems to read from and write to the system disk more frequently than most systems; this slows down

(1a) FRC(x) =  $x \mod 1$  (i.e., the fractional part of x) FIX(x, n) = value of x rounded off to n decimal places MOD(x, n) =  $x \mod D$  n (i.e., remainder when dividing x by n) MAX(x1, x2,...,xn) Highest valued member of a set of numbers MIN(x1, x2,...,xn) Lowest valued member of a set of numbers

(1b) CX-1 Function Microsoft Equivalent

ASC\$ CHR\$ CHR\$ STR\$ MID\$

**Table 1:** Handy arithmetic functions available under Canon CX-1 BASIC (1a), and string functions that are incompatibly named for conversion from Microsoft BASIC (1h).

the operation of many commands. We were surprised that the system accesses the disk during certain phases of operation—for instance, every time the BASIC program in memory is edited and run (the disk access

The Canon CX-1's one-piece construction and its monochrome green display screen make it quite at home in an office setting.

comes after you type the RUN command).

Another feature of the MCX operating system is the SECURE command, which allows you to cause a BASIC program file on disk to assume the "secured" state. A secured file can only be executed, not listed. This provides a modicum of software protection, since it prevents unauthorized users from reading the source code. When a file is secured, a six-character password is requested. Only by correctly reiterating this password can a file be unsecured.

#### Software: BASIC Interpreter

The most important subsystem of MCX is Canon CX-1 BASIC. This in-

teresting dialect of BASIC contains certain features seemingly borrowed from FORTRAN. This version of BASIC uses type declarations akin to those in FORTRAN, the double asterisk ("\*\*") for exponentiation, FORMAT statements, and an interesting form of subprogram linkage. Perhaps the most attractive feature of CX-1 BASIC is its ability to use alphabetic labels for program lines. Here is a sample program in CX-1 BASIC:

10 FOR I=1 TO 100

20 N=N+I

30 IF N>2000 GOTO [FINIS]

40 NEXT I

50 [FINIS] PRINT I: END

Notice that each line still has a line number, as in ordinary BASIC, but it can also have a label in brackets after the line number. This label can be referenced in GOTO, GOSUB, and IF... GOTO statements.

Another unique feature of CX-1 BASIC is its CALL statement, which allows an executing BASIC program in memory to call a BASIC program on disk as a subroutine. Upon encountering a CALL, the operating system searches for and loads the called program into memory, executes it, and then returns control to

the original calling program. Values of variables can be passed between programs by declaring them with a PARAM statement in the called program. It is possible in this way to have many BASIC routines in memory at once (assuming they all fit, of course).

This powerful capability allows the programmer to write structured, modular programs. Libraries of commonly used Canon-BASIC routines can be developed and tested individually. These routines can then be used by other programs or executed sequentially to form new, more complex programs.

Also, it has a built-in XREF command, which provides a cross-reference listing of a BASIC program, listing all variables and the lines in which they occur. To our knowledge, this is the only BASIC interpreter that comes with this command built in.

CX-1 BASIC contains several unusual and useful functions, such as the arithmetic functions shown in table 1a. Two other unique keywords are SAVECRT% and LOADCRT%. which save and recall the current video-screen image as a 1920-byte disk record.

One last observation about CX-1 BASIC: some of the string functions have nonstandard names compared to almost all other versions of BASIC (certainly the Microsoft-derived varieties). Some examples of these are shown in table 1b. This can be quite confusing at first to an experienced BASIC user. It also complicates the conversion of programs to or from other versions of BASIC.

#### Other Software

In addition to the BASIC language, several other important subsystems of MCX come as standard equipment with the computer, including a lineoriented text editor (similar to the familiar ED of CP/M) and a 6809 assembler and debugger. Finally, it also has a text formatter called CROFF (Canon's version of Unix's NROFF?) that, unfortunately, we were not able to test.



Photo 7: NEC's PC-8001A together with the color monitor, PC-8012 I/O unit, and PC-8032 dual floppy-disk drive.

## **NEC PC-8001 A**

The Nippon Electric Company (NEC) PC-8001A, shown in photo 7, is a version of the PC-8001 that has been adapted for the American market. (We previously reviewed the original unit as it was sold in Japan; see our article "The NEC PC-8001: A New Japanese Personal Computer," January 1981 BYTE, page 72.) As you would expect, there are few differences. To avoid duplication, we shall concentrate on those differences and on the floppy-disk drives and I/O chassis, which we did not review last time.

As closely as we can determine, the software for the PC-8001A is identical to that of the PC-8001-both run Version 1.1 of N-BASIC, written for NEC by Microsoft. (On the unit we tested, there was one galling difference: the cursor would not appear when the screen was in the 80- or 72-characters-per-line mode. An NEC spokesman, however, assured us that this was due to a defect in the unit we were testing and is not a characteristic of the system.)

#### Keyboard and Character Set

The katakana characters available on the PC-8001 display have been replaced by the Greek alphabet and a set of superscripts (see photo 8 on page 70). The keyboard, aside from the absence of kana legends on the keycaps, has only two differences. What was the Roman/katakana key

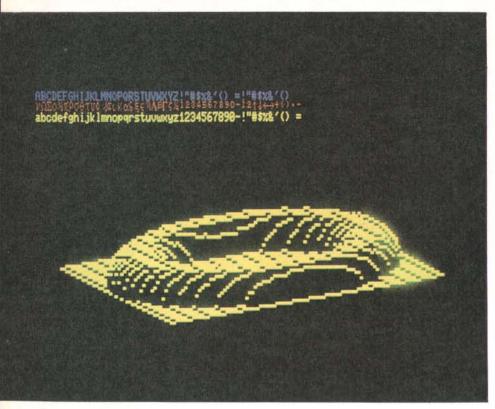


Photo 8: The NEC display. Katakana characters in the Japanese version have been replaced by Greek characters and superscripts in the American version.

#### At a Glance

Name

**NEC PC-8001A** 

#### Distributor

NEC Information Systems Inc. 5 Militia Dr. Lexington, MA 02173 (617) 862-3120

#### **Dimensions (Inches)**

31/4 by 16% by 11

#### Microprocessor

μPD780C-1 [8-bit, Z80-compatible]

#### Size of User Memory

32K bytes

#### Number of Keys

#### Number of Function Keys

5 (shift yields 10 functions)

#### Standard Interfaces

RS-232C; audio-cassette tape; monochrome video monitor; RGB color monitor; printer; expansion bus

#### Optional Interfaces

Floppy-disk drives: I/O chassis; communications subsystem (IBM 3270, 3780, and HASP protocols)

#### **Expansion Sockets**

1 (system bus)

#### **Character Sets**

Roman, Greek, superscripts, graphics

#### Graphics/Color Resolution

160 by 100; 80 by 25 (character-oriented)

#### Number of Colors

#### Other Features

Time-of-day clock; beeper

#### Prices

Keyboard/processor \$995 RGB color monitor \$995 Dual floppy-disk drive \$995 1/O unit \$649

on the 8001 is a much needed shiftlock key on the 8001A, and a duplicate "-" (minus) key in the 8001's numeric keypad has been replaced by a locking "alternate character set" (i.e., Greek and superscripts) key on the 8001A.

Unfortunately, neither the alternate character set nor the graphics character set are indicated by legends on the keycaps—this makes them extremely awkward to use. If you have forgotten which is the Greek "gamma" (y) key, for example, you have to open the instruction manual, turn to the keyboard diagram, locate the gamma key, count the number of keys to the edge of the keyboard in the diagram, count the same number of keys in from the edge of the actual keyboard, and finally press the key. While most of the other computers reviewed here make you use this same sequence for graphic-character input, NEC forces you to do it for both graphics and Greek characters. Such a nuisance could and should be remedied, either by inscribing the alternative characters on the tops or fronts of the keys or by offering a set of stick-on labels for both alternative character sets.

#### What's Inside?

Inside the keyboard/processor module, we found only two differences between the Japanese and American versions. The American version has a thick metal cover over the main printed-circuit board. This cover protects and stiffens the board underneath, but it was probably added as a shield to help the PC-8001A meet the Federal Communications Commission's stringent RFI (radio-frequency interference) emission limits. Also, the American version has more memory, 32K bytes, as standard equipment. (Because part of this memory is used for the display, up to 26,786 bytes are available to the read-only-memory-based BASIC interpreter for program and data storage, while 19,367 bytes are available to the disk BASIC system.) The NEC μPD780C-1 microprocessor, which is

practically identical to the Zilog Z80, runs at 4 MHz.

Judging from our experience with the Japanese version, the hardware is quite reliable. We have used our PC-8001 both as a computer and as a terminal almost daily for over a year and a half with no trouble.

Our only quibbles have been relatively minor. One is the location of the Reset button, which extends from the rear of the console. It is easily triggered by accident if you push the keyboard against books or a wall at the back of your desk. We eventually remedied this minor problem by hanging a large hex nut on the protruding button. Our other quibble is the RS-232C serial interface-instead of a standard DB-25S connector on the outside of the case, NEC provides only a DIP (dual-inline pin) socket hidden away in a relatively inaccessible spot inside the case. NEC does sell an adapter cable with a DB-25, but the added expense should not be necessary.

The size of the NEC keyboard/processor module is attractively small: only 8.3 by 26 by 43 cm (31/4 by 101/4 by 16% inches), hardly bigger than just the keyboard. It is light enough to hold on your lap while you type, and it can easily be shoved to the side of your desk top when it's not in use-a definite advantage if your desk is crowded and doesn't really have room for a computer. Moreover, like most of the Japanese computers reviewed here, it can serve double duty either as a computer or as a remote terminal for a larger system.

#### Peripherals and Expansion

Of course, such a small chassis has no room inside for expansion, but to many users that is unimportant. For those who do wish to expand their systems, NEC sells the PC-8012A I/O unit shown in photo 9, a box that contains a power supply, 32K bytes of RAM (random-access read/write memory), sockets for 2K bytes of PROM (programmable read-only memory), interrupt-control circuitry,

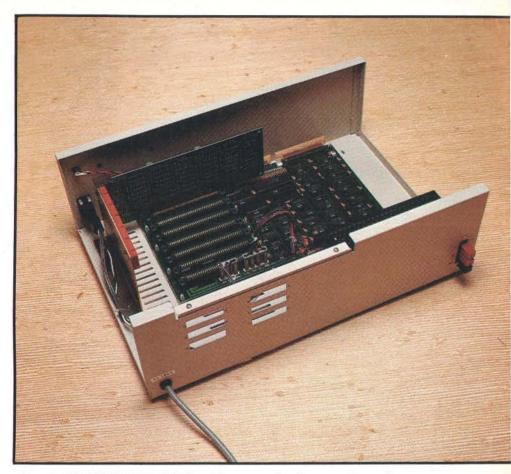


Photo 9: The NEC PC-8012A I/O unit has seven slots for expansion and connectors on the back that can carry nonstandard voltages to the bus.

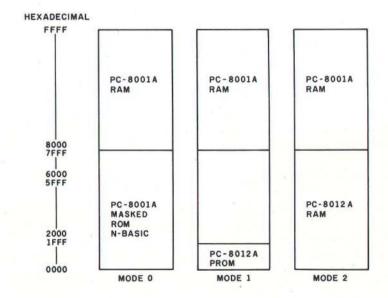


Figure 1: The NEC PC-8001A can operate in any of three memory modes when the PC-8012A I/O unit is connected.

and an extension of the system bus (called the "mother bus") with seven 36-pin slots for plug-in cards. One of these slots normally holds a floppy-disk interface card, and the PC-8031 double disk drive can plug into the 8012A. If you don't need the interface box, the disk drive can apparently be connected to the keyboard/processor module through another less widely advertised accessory, the PC-8033 disk-interface unit. A second double disk unit, the PC-8032, can be daisy-chained to the 8031.

#### Making the Connection

NEC will win no industrial-design awards for this arrangement of the peripheral devices. Both the disk drive and the I/O unit are big and awkward, and the interconnecting cables provided with the units are too short to allow you much freedom in the way the boxes can be arranged on a flat surface. The expansion unit must sit about six inches behind the keyboard/processor. By straining the cable a bit, you can place the disk drive to either side of the keyboard. The combination of short, wide peripherals and short cables largely negates the advantages of the 8001A's small size.

Nor has the cabling arrangement been designed with an inexperienced or inept user in mind. Instead of separate connectors mounted firmly to the chassis, slots located in the chassis give access to edge connectors on the printed-circuit boards. The boards are recessed and slightly flexible, and, since there is inevitably some play in their mountings, seating the connectors properly or unplugging them requires considerable fumbling.

Moreover, the connectors have not been "idiot-proofed"; they can be inserted upside down about as easily as they can be inserted right side up. Indeed, the disk-unit-to-I/O-unit (8031 to 8012A) cable almost begs to be inserted upside down—an arrow on the connector that is supposed to indicate proper orientation is printed on the bottom of the connector, where it is

invisible when the connector is oriented correctly.

#### Using Expanded Memory

Three memory modes are available for using the additional memory in the I/O-expansion unit (see figure 1). In mode 0, none of it is used, while in mode 1. only the PROM in the I/O unit can be addressed, along with the 32K bytes of RAM in the keyboard/ processor module. In mode 2, the 32K bytes of RAM in the 8012A are mapped into the memory-address space normally occupied by the BASIC-interpreter ROM, giving a full 64K bytes of user memory, but no BASIC. NEC spokesmen say that CP/M is available for the PC-8001A; undoubtedly, it must run in mode 2. Up to four more 32K-byte banks of RAM can be installed in slots in the motherboard. Any one of these banks can be swapped in address space with the main memory under software control, but no currently available software supports this.

Judging from our experience with the Japanese version, the hardware of the NEC PC-8001 is quite reliable.

#### Control-Line Versatility

The bus structure of the 8012 appears to be designed for either instrumentation or process control. It looks like it could be easily interfaced to the IEEE-488 bus. It has separate lines for eight levels of interrupts, and an 8214 interrupt-control chip is an integral part of the unit. Also included is a 600-hertz (Hz) real-time clock that can be used to generate an interrupt every 1.67 milliseconds (ms); during such an interval, the microprocessor could poll or service many more than eight devices.

In addition to the address, data, control, and interrupt lines, the system bus has six undefined lines, plus two sets of lines that can carry voltages input through a set of connectors at the rear of the chassis. These features make the bus particularly convenient to those wishing to build homebrew interfaces, even to systems requiring voltages other than the standard +5 volts (V) and  $\pm 12$  V.

#### Floppy-Disk System

While, as we noted above, the dual floppy-disk drives take up a lot of real estate on your desk because they are mounted side by side, horizontally, they do hold a lot of data. The soft-sectored 51/4-inch disks are formatted for 256 bytes per sector, 16 sectors per track, with 35 tracks per disk (34 user-accessible), for a total of 139k bytes per disk, although the disk directory won't allow a lot of small files. The cabinet is made of the same sturdy metal as the 8012 I/O unit, and, in addition to the clasp that snaps the drive doors open and shut, each drive has a separate lever that can be used to lock it shut.

The disk-drive unit is also "intelligent"—a separate controller within the drive unit does some of the work associated with storing data on a disk; the unburdened main processor just passes data through an I/O port. This is probably the reason for the major peculiarity of the NEC disk-access software.

In most disk BASICs, you just slide a disk into drive number 2 and type LOAD "2:filename" and the file loads. If you try that with the PC-8001A, you will get the error message "Disk Not Mounted"—you must type MOUNT 2 before you can use the disk. When you are done with the data on the disk, you must similarly type REMOVE 2 before removing the disk; if you insert another disk in the same drive, you must MOUNT it as well. These commands are necessary because the microprocessor works with a copy of the disk's fileallocation table that it reads into user memory when it executes the MOUNT command. The disk's copy of this table is not updated until the

**The revolutionary Discovery multiprocessor** is the only system that allows the total integration of powerful 16 bit 8086 processors with the more standard Z-80 user processors. The DISCOVERY system may be configured in any 8 bit/16 bit combination, or as a totally exclusive 16 bit system only to provide the ultimate in performance and flexibility in advanced micro systems.

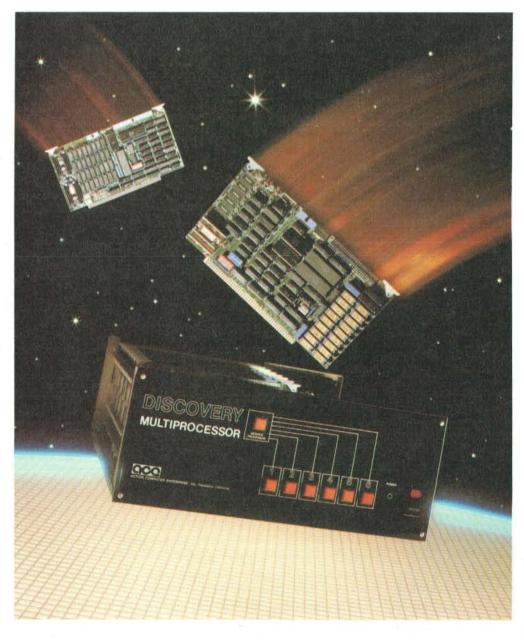
**Ultimate performance.** The dpc-186 is the most sophisticated single board microcomputer available today offering more power and faster processing time through the 8086 CPU for bigger, more complex programs. Memory starts at 128 K (compared to the Z-80's 64 K), and is expandable to 1 megabyte. And the dpc-186 is fully compatible with the standard DISCOVERY multiprocessor system permitting efficient upgrading as future needs develop, without sacrificing any of your extensive hardware and software investment.

**World's best multiprocessor system.** The DISCOVERY system provides separate processors and memory for each of its 16 users. It offers full CP/M\*and CP/M-86\*compatibility, interprocessor communication, and shared and private files. Each user can take advantage of shared peripherals and cross submitting of tasks between processors. The system is controlled by a unique, two board dpc-280 service processor and dpc/os distributed processing operating system.

By the board or by the system. The DISCOVERY multiprocessor is ready for immediate delivery as a complete system, as processor boards, and everything in between. It offers exclusive technology in multiprocessing, yet is fully compatible with existing standards including CP/M and S-100. It is quite simply unmatched in performance, capabilities and offers a far greater degree of flexibility.

DISCOVERY—offering a whole new world of possibilities.

### For the first time, 8 and 16 bit processor intermixing.





REMOVE command is executed. If you forget to issue the REMOVE command, the manual warns, the interpreter will not be able to locate any of the files you have added during that session, and, in the worst case, all data on the disk will be lost.

#### Documentation

As we explained earlier, we have not mentioned documentation for most of the machines reviewed here. Because some of them have not vet been introduced into the U.S. market, many of the user's manuals we saw were either preliminary translations or in the original Japanese. But the NEC PC-8001A is already being sold here, and the documentation we saw was what a buyer would see. We therefore decided to mention the documentation briefly to reassure would-be buyers who fear that the instructions for their new, expensive, and complicated Japanese computer may be as mystifying as the instructions that come with a cheap madein-Japan Christmas toy.

Although NEC's documentation is readable, in places it could be much better. The PC-8012A I/O Unit User's Manual would probably be somewhat mystifying to a totally inexperienced user because it seems to presuppose a good knowledge of both hardware and software. There are not enough step-by-step, do-this-then-do-that instructions; complicated features are inadequately explained; and some of the text is just plain bad English.

The PC-8001A Microcomputer Reference Manual is uneven in quality. Explanations of the BASIC commands are good, but they duplicate some sections of the NEC BASIC Language Learning Guide word for word. Explanations of more complicated hardware or system features, such as the terminal mode and the assembly-language monitor, tend to be confusing and poorly written. (One extreme example discusses the TM (test memory) command: "Note: As for the contents of the FF39 through FF3C numbers, since only

under normal circumstances does TL (sic) memory of the FF39 - FF3C numbers become significant, after the TM command is entered in a situation in which an error occurs for a few seconds." Anyone find a verb there?)

Moreover, the English version leaves out a lot of valuable information included in the Japanese documentation, the *PC-8001 User's Manual*. Most conspicuously absent are the pinout tables for the printer interface, system bus, and RS-232C interface. The last is particularly

noticeable because the RS-232C connector is a DIP socket and not a standard DB-25 connector.

On the other hand, the PC-8031 Mini Disk Unit User's Manual is pretty good, although it could be improved by the addition of some photographs of assembled systems. And NEC's BASIC Language Learning Guide is excellent—a well-planned and well-written primer with many examples and a set of self-test review exercises and answers at the end of each chapter.



**Photo 10:** The Hitachi MB-6890 personal computer together with the color video display, double floppy-disk drive, and dot-matrix printer.

### Hitachi MB-6890

The word that best describes the Hitachi MB-6890, shown in photo 10, is *flexible*. It offers as standard equipment several features that other manufacturers provide only as expensive add-ons, such as a light-pen interface and an RS-232C interface complete with DB-25 connector. Also, it has such a profusion of hardware- and software-controllable switches and options that each user can configure the machine to individual taste.

#### **Details of Construction**

The case of the Hitachi processor unit is entirely plastic except for the detachable metal lid covering the rear. The rather thin (0.27-mm, 0.070-inch) base is reinforced with plastic posts in the rear where it is often required to bear the weight of the video monitor, and it is protected in front by the overlap of the substantially thicker plastic of the keyboard. This monocoque construction yields

Next to keeping all your data on Verbatim Datalife<sup>®</sup> flexible disks, the best thing you can do for your computer or word processor is to keep it running clean and error-free.

And the way to do just that is with Verbatim's new Datalife Head Cleaning Kit. It can remove up to 90% of the debris contaminating your drive heads. Dust, dirt and debris that causes data loss and errors, hinders system performance.

#### Quick and easy to use

All you have to do is remove a Cleaning Disk from its protective pouch, put the disk in the special jacket, insert it into your drive and turn it on.

In just 30-60 seconds, your drive heads are cleaned.

#### Cleaning, with no cleaning mess

With your Datalife Head Cleaning Kit there's no hit-and-miss applying solvents that can splash and spill.

What's more, with Datalife Cleaning Disks every time you clean your heads, you can do it with a fresh, clean, disposable disk.

#### Cleans both Single and Dual Head Drives Safely

There's no worry about damaging your system with Datalife Cleaning Disks. And you can use them on single or dual head drives.

#### Protect your investment

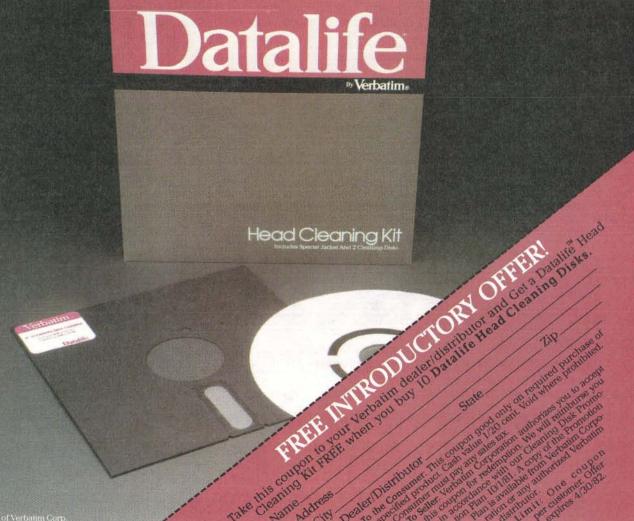
The Datalife Head Cleaning Kit will help you guard against data loss, errors, and degradation of system performance because of debris contamination.

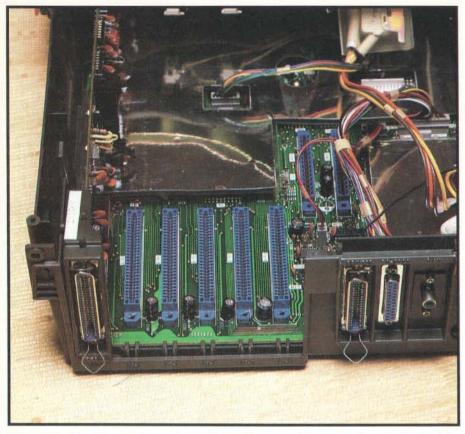
So if you want your data back verbatim, keep it on Verbatim disks. And keep your disk drives clean with Verbatim's Datalife Head Cleaning Kit.

Call (800) 538-1793 for the name of your nearest Verbatim dealer. (In California and outside the U.S. call (408) 737-7771 collect.)

**Verbatim**<sup>®</sup>

Introducing the second best thing you can do for your computer.





**Photo 11:** Hitachi provides a set of individually removable panels along the back of the processor enclosure to give access to individual expansion slots on the motherboard.

#### At a Glance

#### Name

Hitachi MB-6890

#### American Representative

Hitachi Sales Corporation of America 401 West Artesia Blvd. Compton, CA 90220 (213) 537-8383

#### Dimensions (inches)

4¾ by 17% by 20¼

#### Microprocessor

6809, 8-bit

#### Size of User Memory

32K bytes

#### Number of Keys

89

#### Number of Function Keys

5 (with shift gives 10 functions)

#### Standard Interfaces

RS-232C (DB-25); monochrome video

monitor; RGB color monitor; audio-cassette tape; light pen; printer; game paddles

#### Optional Interfaces

Disk drives; extra printers

#### **Expansion Sockets**

6 for I/O; 2 for RAM

#### Character Sets

Roman, katakana, hiragana, graphics

#### Graphics/Color Resolution

640 by 200; 80 by 200

#### Number of Colors

8 on 8

#### Other Features

Time-of-day clock

#### Prices (Yen Equivalent in Dollars)

Keyboard/processor Y = \$1035 Color monitor Y = \$ 860 Disk drive Y = \$1500 Printer Y = \$ 763 a processor cabinet that is adequately strong and remarkably light.

The back of the case, shown in photo 11, shows Hitachi's solution to the problem of how to give access to optional peripheral-device circuit boards plugged into the system's bus. Six 56-pin sockets for edge connectors are mounted on the motherboard, perpendicular to the back of the case, and there is a removable plastic slot panel behind each socket.

The disk-controller board shown installed in the first slot incorporates a similar slot panel, mounted on the circuit card, that both stiffens the card and houses the card's connection to the outside world. Thus, no gaping holes are left for options that you may never install, nor must you arrange to snake expensive lengths of ribbon cable all over the inside of the processor cabinet to reach a fortuitous gap between sections of the case.

Since this plastic case provides no electromagnetic shielding, most of the motherboard and the circuit board underlying the keyboard are covered with thin (0.43-mm, 0.017-inch) sheets of aluminized plastic, making them look like hastily wrapped Christmas packages. Because this "gift wrapping" is staked in place and impedes access to the motherboard, it must surely also impede convective cooling of the electronic components underneath. On the other hand, it provides expensive components with an extra layer of protection against dust or an overturned mug of coffee.

#### System Versatility

The most striking features inside the case are the large number of miscellaneous unused connectors and a plethora of relocatable jumper connections. This suggests that it may be possible to substantially reconfigure the hardware rather easily.

In fact, a number of such reconfigurations are documented in the user's manual. Several of the jumpers have functions you might expect, such as setting the serial data-transfer rate and the transmission/reception parameters for the terminal mode.

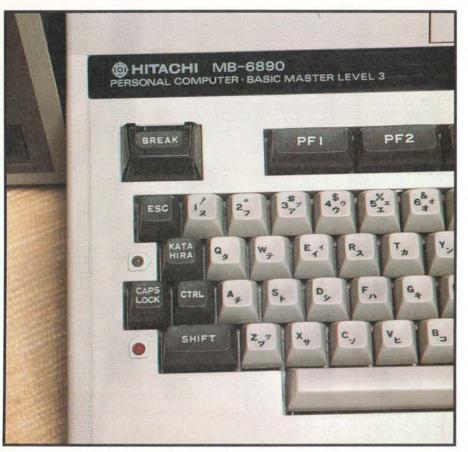


WHEN AMERICAN BUSINESS HITS THE ROAD, AMERICAN BUSINESS DECIDES ON HILTON.



Switch Number	Open	Closed
1	BASIC mode	Terminal mode
2	Interlaced screen	Noninterlaced screen
3	80 characters per line	40 characters per line
4	Normal mode	High-resolution mode
5	Function keys labeled	Function keys unlabeled
6	Half duplex when terminal	Full duplex when terminal
7	7 bits/char when terminal	8 bits/char when terminal
	Hiragana converted to katakana for printer	Hiragana output to printer

Table 2: Functions of the Hitachi state-selection switch.



**Photo 12:** The Hitachi BREAK key is protected by a transparent plastic clamshell. The KATA/HIRA key can change the machine between any of three states—the color of the LED beside it indicates the state.

More unusual is an eight-position DIP switch on the motherboard that can be used to determine what state the machine will be in when the power is turned on (see table 2). Normally, the switch on the console labeled MODE is wired in parallel with DIP switch number 3, the characters-per-line switch. But by simply moving a jumper on the mother-

board, it can be rewired to parallel DIP switches 1 or 2.

We should add that all these parameters can be reset individually by issuing the appropriate command from the keyboard, e.g., WIDTH 80 to select the 80-characters-per-line display mode. If you would rather change several of them simultaneously, you could reboot the system in the

desired mode with the command NEW ON b where b is an expression with a value from 0 to 255, inclusive. The 8 bits of the binary representation of b serve the same purpose as the eight DIP switches; a 1 in the least significant bit (bit 1) corresponds to switch 1 being in the open position.

This is a fine idea, showing great insight into the wide variety of ways people use personal computers. It allows the person who uses the machine primarily as a remote terminal for a large system to turn the MB-6890 on and find a functioning terminal, rather than a computer that can be turned into a terminal only with a lengthy set of commands; it allows the person who wants both a computer and a terminal to configure a machine that switches from one use to the other with one push of a button; and it lets the person who primarily wants a stand-alone computer to find the machine in this form when it is turned on.

#### Keyboard

The keyboard, like that on the other computers reviewed here, has all the typewriter keys, plus a numeric/editing keypad and a set of userdefinable function keys. Controls that are used infrequently (the on/off, reset, and mode-select switches, and a knob controlling the loudness of the click that accompanies each keystroke) are hidden behind a small door at the top of the keyboard. The BREAK key (a powerful stop/reset key) has a transparent plastic clamshell around its front edge (visible in photo 12), which prevents you from hitting it accidentally.

The keyboard has four cursor-control keys. The cursor-left and cursor-right keys have two separate modes of operation. Normally, they move the cursor in increments of one character position, but with the SHIFT key depressed, they move the cursor a word at a time.

Every time you hit a key, the speaker in the bottom of the key-board/processor module produces a click. As we said, a knob adjusts the volume. The electronic clicks are





### "We provide business programs as individual as your business needs."

"Allow me to introduce myself. I'm a Vector computer, dedicated to the advancement of society. And I'd like to tell you how a computer can help you manage your business more efficiently. Especially if that computer is a Vector, like me. Because we're probably the most flexible and cost-effective computers you can find.

"Our programs are the key. Because they enable me to handle sales forecasting, budgeting, job costing and proposals, commissions, personalized mass mailings, charts and graphs. We Vectors can even talk to each other and to other bigger computers.

"Unique combinations of our individual programs can actually customize me to meet your specific requirements. Any combination of our software packages can be assembled right off the shelf, to help you realize your full potential as a salesman, merchant, stockbroker, clergyman, contractor, real estate or insurance agent or whatever your business.

"Choose from Memorite III for word processing and mail list management, Execuplan for financial planning and forecasting, Business Accounting, Data Management for filing and sorting information, Communications and a host of others. And, of course, all we Vectors come with the popular CP/M operating system.

"For more information and your local dealer, call us at (805) 499-5831 or (800) 235-3547. In California, call (800) 322-3577. Or write to us at 500 North Ventu Park Road, Thousand Oaks, CA 91320.

"We'll show you how we small information systems can mean big business for you."

Circle 425 on inquiry card.



#### COMPUTERS FOR THE ADVANCEMENT OF SOCIETY.

Sold and supported by 400 dealers worldwide. Vector Products are approved on General Services Administration authorized ADP scheduled price list. completely inaudible when the knob is set for minimum volume, but the key hitting the mechanical stop at the bottom of its excursion still provides audible feedback. Thus, the only distinctive function served by these clicks is to indicate the repeated entries that occur when a key is held down for more than a half second. Nonetheless, the pitch and duration of beeps from the speaker may be controlled by an assembly-language program. Thus, the speaker can be used to produce sound effects and rudimentary music.

The MB-6890, like most microcomputers, uses a scanned keyboard; the keys are wired in a matrix, with each key capable of closing a connection between a horizontal (row) and vertical (column) electrical line. The keyboard-monitor circuitry detects closure of the switch inside the key by rapidly sending out pulses to successive columns while monitoring the row lines. An input sensed on row x while the output is going to row y indicates that the key at the intersection of x and y was pressed. Since the circuitry can typically complete a scanning cycle many times during the interval it takes a key to close and open again, it is unlikely to miss keys hit by even the fastest typist. Software in the keyboard monitor can aid in deciphering key "rollover," hitting a second key before the first is released.

But the MB-6890 keyboard, either through insufficient scanning speed or inadequate rollover software, does not accept key rollover very gracefully. The manual warns, "Be careful not to press more than three keys at the same time." This may seem an unlikely occurrence during text entry; whether it is or not depends on your skill as a typist, your typing speed, and the type of material you are entering. The problem is most apparent when you hold down the GRAPH key (to input either graphics or hiragana characters, depending on graphics mode) and rapidly type D followed by the adjacent key F. The computer often interprets it as a spurious cursor-up character, and the cursor goes bouncing merrily up to the previous line. Very disconcerting and very annoying!

#### Coping with Characters

The key labeled KATA/HIRA solves the problem of dealing with the four character sets used in Japanese text. Hitachi's elegant solution could easily be adapted to more universal problems. To understand its function, you must know that Japanese, unlike most languages, has four separate writing systems: kanji, katakana, hiragana, and the Roman alphabet. A brief discussion of the function of each appears in the text box "Japanese Character Sets" on page 63.

One of the most intriguing features of the MB-6890 is the light-pen interface, which is standard equipment. The pen, both simple and sturdy, is extremely easy to use.

Most of the Japanese personal computers reviewed here offer a Romanalphabet keyboard with some sort of locking shift key that allows the same keys to be used for katakana as well. There are generally a few very common kanji characters used as graphics keys (the pictographs for "date" and "time," for example), but the hiragana characters require resolution beyond the capability of most noninterlaced video displays.

Here's the way Hitachi approached the problem. The MB-6890 has an interlaced graphics mode (which doubles the vertical resolution of the characters), and in that mode, it offers you a choice of Roman, katakana, or hiragana characters. Normally, the keyboard produces Roman characters. Hit the KATA/HIRA key once and an LED beside it

turns red, indicating that the keyboard is now accepting katakana input. Hit the key again and the LED turns green, indicating that the keyboard is accepting hiragana input. Hit it a third time and the LED goes out—you are back in the Roman mode.

#### File Operations

The Hitachi flavor of BASIC (Level-3 BASIC, a product of Microsoft) allows the programmer to pass files of data to or from any of the I/O interfaces—cassette tape, serial port, disk, printer, screen, or keyboard—using a common command format. For instance, to output a program listing to any of these devices, there is the command

LIST "file descriptor" [,line number [,line number]]

where *file descriptor* is a standard string that identifies the device and the other parameters are optional. Thus, LIST "LPT0:" sends the listing to printer 0, whereas LIST "CAS0:TEST" sends it out the cassette interface into a tape file named TEST.

#### Light Pen

One of the most intriguing features of the MB-6890 is the light-pen interface, which is standard equipment (the pen itself, however, is an option). The pen is remarkably easy to use. Since the photodiode in its tip is mounted in a retractable switch. you can both locate the pen and trigger it by simply poking the tip against the screen. The pen is simple and sturdy; numerous falls from the desk top to the floor did not seem to damage it. This interface is supported in software by Level-3 BASIC, which offers a set of keywords for controlling the light pen (see table 3).

The keywords reflect the areas where light pens are most useful:

 Option selection from a menu. The computer displays a list of choices, each one next to a box, and you in-



Screen Director™ retrieves and displays any standard image file on your Apple's video monitor, large screen TV or color printer. For only \$150, Screen Director™ gives you a filmmaker's finesse in boardroom presentations, management briefings and demonstrations for clients.

With Screen Director™ you can scroll forwards and backwards through any color displays, with dissolves or cuts from one image to the next—all at the touch of two buttons. You can even enhance your **Apple Business Graphics** with title slides in a variety of fonts and colors.

### Spice your Apple with cinema.

Screen Director<sup>™</sup> includes both the two-button controller and all necessary software.

For information on dealers of Screen Director™ in your area, call (617) 491-3377.



Business & Professional Software, Inc. 143 Binney Street Cambridge, MA 02142 ON PEN GOSUB line number when pen in undefined area [,line number when in nth area...] -Branches to the nth subroutine when the light pen is pushed against the nth defined area

PEN n;[(horizontal starting point, vertical starting point) – (horizontal end point, vertical end point)] -Defines rectangular areas for ON PEN command

PEN ON-Pushing pen causes an interrupt

OFF-Pen does not cause interrupt

STOP-Pushing pen does not generate interrupts, but the status is stored; the subroutine executes at the next PEN ON

PEN(argument)—a variable returning the following values for different values of the argument:

Argument Value returned

1

TRUE when pen pressed

Horizontal position of pen when pen pressed

2 Vertical position of pen when pen pressed

3 TRUE while pen is being pressed, FALSE else

4 Current horizontal position as long as pen is pressed 5

Current vertical position as long as pen is pressed

Table 3: Hitachi MB-6890 light-pen commands.

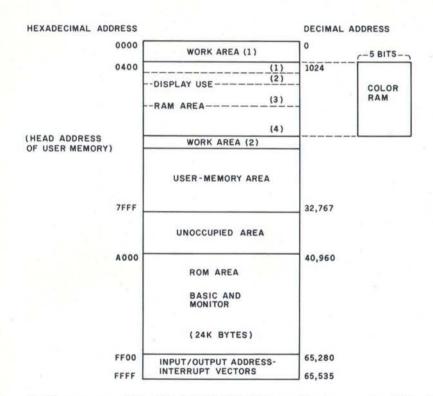


Figure 2: Memory map of the Hitachi MB-6890. This machine has an extra 5-bit-wide segment of memory that is addressed parallel to the segment of RAM that controls the video display. The extra 5 bits are used to specify the color of the corresponding pixel.

dicate your choice by pointing to a box with the light pen. Done properly, this can make use of the keyboard unnecessary.

 Screen location. You indicate where something is to be done on the screen by pointing to it with the light pen-much simpler than fiddling with cursors and control keys.

Drawing. Instead of entering com-

plicated shapes one point at a time, you just draw them on the screen using the light pen.

Nonetheless, light pens do have some inherent limitations, and the Hitachi unit is no exception. Since they work by detecting the image in the video raster on the screen and inferring the pen position from the timing of the scanning beam, most light pens occasionally make mistakes. You trigger the pen here and the computer thinks that it was over there. In the Hitachi, the light pen seems particularly prone to wraparound errors. When you touch a point near the lefthand edge of the screen, the computer thinks you touched the right-hand side. But this is a problem that a clever programmer could largely circumvent by adding a verification step, such as letting a small blinking dot confirm the entry location before the computer accepts the data.

The Hitachi system displays another problem that results from the combination of a light pen with a color video display. The photodiode in the pen is not equally sensitive to all three primary additive colors. In fact, it is blind to red. This fact is not mentioned in the English-language version of the manual, but one of the demonstration programs supplied by the manufacturer shows that Hitachi is aware of the problem. In a routine in which you are supposed to select colors by pointing to the correct sample with the light pen, each color swatch has a white square in its center.

#### Graphics Display

Hitachi has made an interesting trade-off between memory use and display resolution. As the memory map in figure 2 shows, some of the

## One of the great masters?

Although the Datasouth DS180 matrix printer may not exactly rate as a work of art, our customers have a very high opinion of its value. Over the past year, we have shipped thousands of DS180 printers to customers throughout the world. Many of our sales now come in the form of repeat business—a strong testimonial to the acceptance of a product.

The success of the DS180 in a very competitive market did not happen by accident; rather through our sensitivity to the needs of the industry. This sensitivity we carry through research and development, production and quality con-

trol and finally to after sales support and service.

Recently we introduced new enhancements to make the DS180 printer even more versatile. Dot addressable raster scan graphics produces output of computer generated charts, maps and graphs at a resolution of 75 x 72 dots per

inch. Variable horizontal pitch selection allows printing at 10, 12 or 16.5 characters per inch plus double wide printing at 5, 6 or 8.25 characters per inch. The expanded 2K FIFO print buffer handles a full CRT screen dump at up to 9600 baud without delaying the host system. We also offer transparent mode for isolating communications problems, and for APL users, the dual ASCII/ APL character set option.

Checkour list of features and we think you will agree that the DS180 offers the most complete performance package in matrix printers. DS180 PRINTER STANDARD FEATURES

\*Microprocessor Control

\*Vertical Tabs

\*Vertical Tabs

\*Vertical Tabs

\*Vertical Tabs

\*Vertical Tabs

\*Ompressed Print — 10. 12, 16.5 cpi

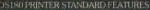
\*High Resolution Dot — Addressable Graphics

\*Auto Line Feed

\*Auto Line Feed

\*Auto Line Carriage Return

\*Auto End of L



- Top of Form
   Horizontal Tabs







The DS180 is available nationwide through our network of sales/service distributors.

> Now Available Nationwide Through Participating COMPUTERLAND Stores

CORPORATE PERFORMANCE

Circle 132 on inquiry card.

computer corporation

	Normal		High-Resolution		
Horizontal Characters Graphics Resolution Color Resolution Memory Required/Screen	40 80 by 100 40 by 25 1K	80 160 by 100 80 by 25 2K	40 320 by 200 40 by 200 8K	80 640 by 200 80 by 200 16K	
Character Mode Usable	40 by 25	80 by 25	40 by 25	80 by 25	
Character Matrix	8 by 8 pixe	s	8 by 16 pixels		
Maximum Pages	16	8	2	1	
Memory Available to BASIC	29,546	28,522	22,378	14,186	

RAM is taken up by the display; how much depends on resolution. Apparently, a separate 5-bit-wide memory that controls color parallels the main memory. In the highest resolution mode, each pixel (picture element) of the 640- by 200-pixel screen can be turned on or off individually, but only one color in addition to the background color is available to pixels in a given colorresolution cell. Thus, lines of different colors intersecting within one color-resolution cell take the color of the last line entered. This means that extremely high-resolution graphics are possible if you either restrict yourself to one color in addition to the background color or are very careful about where and how different colored lines intersect. If you are not careful, you get lines changing colors and "jaggies" along diagonal borders between areas of different colors.

As table 4 shows, you are also able to trade off resolution against the number of video pages, where each page may contain a different picture. Although it may take a relatively long time to draw a particular picture, it is possible to put separate pictures on separate pages and rapidly flip back and forth by switching pages. This feature could be useful for animation, games, storytelling, or graph and chart presentation.

#### Peripheral Devices

In addition to the display and light pen mentioned above, the system we evaluated included the Hitachi MP-3540 dual floppy-disk drive and MP-1040 dot-matrix printer. The connectors were well marked and designed so that they could not be inserted backward. Thus, it is nearly impossible to assemble the system incorrectly. We put everything together in less than five minutes without even looking at the manual. Hitachi, unlike some of the other manufacturers discussed here, included generous lengths of cable (more than three feet for each unit). The sockets for D-shaped connectors had wire ears that locked them in place so that they could not accidentally be pulled loose.

The dual 5¼-inch floppy-disk-drive unit is reasonably compact, measuring 27 by 27 by 21 cm (10% by 10% by 8½ inches), and unbelievably sturdy. The two drives are mounted vertically in a thick (1.65-mm, 0.065-inch) aluminum chassis that looks like it could withstand any abuse short of artillery fire. It weighs 11 kg (24 pounds).

Surprisingly, the disk drives are fan-cooled, even though the keyboard/processor unit is not. And, in addition to the power switch on the back, a "Motor" button on the front starts the drives spinning, independent of whether the processor is trying to read or write a disk. This might be useful if you have trouble centering disks when you put them in. A disk mounted on a rotating spindle tends to center itself.

The doors to the drive units do take a bit of getting used to. Instead of flipping a latch, to open a door you push the door in, and a spring pops it open. The springs are very firm, and you initially get the erroneous feeling that you are crunching the floppy disk.

The disks are soft-sectored and single-density, with 128 bytes per sector. With 16 sectors per track and 40 tracks per disk, each disk can store a total of about 80k bytes. The middle tracks on each disk are reserved for the directory.

The Disk BASIC supplied with the system supports both sequential and random-access files. Also, it has a command that permits you to write to a specific sector on a specific drive, irrespective of file status. (This could be a dangerous command; using it carelessly could wipe out files, or even the directory.)

The MP-1040 printer is remarkably quiet and quick, the latter due to the bidirectional motion of the print head that causes the characters to appear on the paper boustrophedonically. The MP-1040 is a bit wider than the disk unit, measuring 36.1 by 32.8 by 13.3 cm (141/4 by 13 by 51/4 inches), but its rubber feet are close enough together that it can sit on top of the disk drives if necessary. It can handle either fan-folded or rolled paper. either friction- or sprocket-feed, and can print not only Roman and katakana characters, but the more detailed hiragana characters as well. A rotary switch on the front panel allows the selection of 10 different form lengths, and push-button switches manually cause form and line feeds.

## DAYSTAR **BRIGHTENS YOUR DATA.**

You have the problem . . . We have the solution . . . The 51/4 Winchester Sub System. This new Day Star Sub System offers you reliability and versatility at a price you can afford. • 51/4-inch drives, with drives available in 4, 8, 12, or 16 megabytes. • Subsystems are available with 1 megabyte floppy backup. • This unit is available with or without case or power supply. • It interfaces to the S-100, TRS-80 Model II, TRS-80 Model III, Apple II, IBM Personal, Heath/ Zenith 89, N.E.C., Xerox 820 and soon to many others.

 Intelligent controller using Z80B C.P.U.
 The 5¼ Winchester has an on board addressable data buffer. • It features a D.M.A. (Direct Memory Access) when available. • It gives you power fail data protect. . The Winchester works with 115 or 230 VAC 50/60 C.P.S. • You can go from Winchester to floppy communications without C.P.U. assistance. • This small compact package unit gives you 625,000 (625K bytes) bytes per second data transfer.

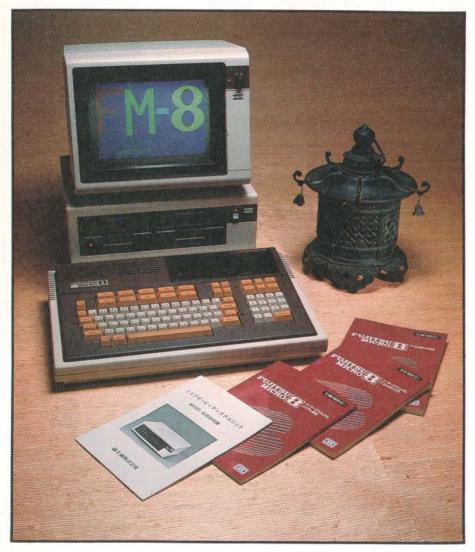
Let Day Star brighten your data with their new 51/4 Winchester Sub System.



1198 E. Willow St. Signal Hill, CA 90806 (213) 595-8571 Telex:(814)656-914 ETYBLGB

Circle 133 on Inquiry card.

## Fujitsu FM-8



**Photo 13:** The Fujitsu FM-8 computer. Shown here are the keyboard/processor module, color monitor, and two disk drives, all connected together with lengthy cables for ease of rearrangement. Other optional hardware includes a printer, modem, joystick, and Z80-processor card.

#### Update

At press time, we learned from Fujitsu that the company does not plan to sell in America the version of the FM-8 reviewed here. Instead, there is a strong possibility that Fujitsu will introduce an American version of the unit some time in the near future.

With the Fujitsu FM-8 ("Fujitsu-Micro 8"), we were faced once again with the unenviable task of attempting to use a computer for which documentation is not yet available in an English version. (We first went through this when we obtained our original Japanese-version NEC PC-8001.) Fortunately, many technical terms in the manual are written in katakana or English. Therefore, we

were able to decipher most of the salient features of the machine and obtain a fairly good working knowledge of it.

#### Hardware at First Look

The FM-8 computer system consists of three modules: keyboard/processor, 5½-inch floppy-disk drives, and video monitor, as shown in photo 13. Unlike some of the other computers, however, they are connected with long cables that can be rearranged to fit available desk or wall space. A four-foot ribbon cable goes from the keyboard through a small interface box to the disk drives, and an even longer round cable with DIN connectors goes to the color video monitor.

#### Keyboard and Controls

The keyboard has 95 keys in all, including most of the familiar ones encountered already (10 function keys, numeric keypad, editing keys). It does have a few unique features, however. Three of the keys, the CAP (uppercase lock) key, the katakana key, and the INS key, have adjacent red LEDs to indicate their status.

The INS key toggles the computer in and out of insert mode. When in insert mode, characters can be inserted in the middle of lines, and the line is automatically shifted over to accommodate the new characters.

Two other interesting keys are the EL (erase line) key and the DUP (duplicate) key. The EL key performs the standard erase-to-end-of-line function, which is useful but not often found on a keyboard. The DUP key causes the contents of the previous line to be duplicated into the current line being typed, up to the next tab stop. In other words, hitting the DUP key will enter as many as eight characters from the previous line into the current line. This is useful, for exam-



## Turn your Apple into the world's most versatile personal computer.

The SoftCard™ Solution. SoftCard turns your Apple into two computers. A Z-80 and a 6502. By adding a Z-80 microprocessor and CP/M to your Apple, SoftCard turns your Apple into a CP/M based machine. That means you can access the single largest body of microcomputer software in existence. Two computers in one. And, the advantages of both.

Plug and go. The SoftCard system starts with a Z-80 based circuit card. Just plug it into any slot (except 0) of your Apple. No modifications required. SoftCard supports most of your Apple peripherals, and, in 6502-mode, your Apple is still your Apple.

CP/M for your Apple. You get CP/M on disk with the SoftCard package. It's a powerful and simple-to-use operating system. It supports more software than any other microcomputer operating system. And that's the key to the

versatility of the SoftCard/Apple. Circle 280 on inquiry card.

BASIC included. A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COM-MON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

More languages. With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

Complete information? It's at your dealer's now. Or, we'll send it to you and include a dealer list. Write us. Call us. Or, circle the reader service card number below.

SoftCard is a trademark of Microsoft. Apple II and Apple II Plus are registered trademarks of Apple Computer. Z-80 is a registered trademark of Zilog, Inc. CP/M is a registered trademark of Digital Research, Inc.



Microsoft Consumer Products, 10700 Northup Way, Bellevue, WA 98004 • (206) 828-8080

#### At a Glance

Name

Fujitsu FM-8

American Representative

Fujitsu America Inc. 2945 Oakmead Village Court Santa Clara, CA 95051 (408) 727-4300

Dimensions (inches) 41/4 by 19 by 131/4

Microprocessors Two 8-bit 6809s, one 4-bit 8841

Size of User Memory 64K bytes

Number of Keys

Number of Function Keys

Standard Interfaces

Analog input; RS-232C; expansion port; monochrome video monitor; RGB color monitor; printer

Optional Interfaces

Z80 processor card; disk drives

Expansion Sockets
1 (for Z80 card); 1 for system bus

**Character Sets** 

Roman, katakana, graphics; optional: hiragana, Greek, Cyrillic, kanji

Graphics/Color Resolution 640 by 200

Number of Colors

Other Features

Time-of-day clock; optional bubble memory

Prices (Yen Equivalent in Dollars)

Y = \$3400 (entire system) Keyboard/processor Y = \$1035 Color monitor Y = \$ 860 Disk drive Y = \$1500 Z80 expansion card Y = \$50

ple, if you have two lines in a program such as:

100 A = C(I,J) + D(I,J) + 4\*E(I,J)110 R = C(I,J) + D(I,J) + 4\*E(I,J)

Once you have typed line 100, you merely type "110 R=" and then hit the DUP key a few times to enter the rest of the line, which will be copied from the previous line.

The on/off switch for the computer is located under a hinged door in the upper right-hand corner of the keyboard. In our unit, there is nothing else under this door except a little niche that's just the right size for storing a bag of peanuts or a candy bar (to provide a little extra sustenance on those long nights of computing).

Fujitsu's engineers actually reserved this space to contain two optional bubble-memory-cartridge sockets. (We discuss bubble memory more in the review of the Bubcom80, coming up next.)

The back of the keyboard/processor unit contains jacks for several standard interfaces: floppy-disk

drives, serial RS-232C ports and parallel printer port, color video monitor, monochrome video monitor, and audio-cassette tape. A DIN jack labeled ANALOG IN provides at least two analog input ports that can be read from BASIC or assembly-language software. These ports can

## The Fujitsu FM-8's multiprocessor division of labor shows up in speed.

be used, for example, for connecting game paddles or a joystick. There is also a 10-position DIP switch for setting various default parameters such as data rate and parity format for the remote-terminal mode.

#### Inspecting the Interior

Inside the keyboard/processor module, several surprises await you. First, it has three microprocessors!

Two are 8-bit 6809s, one serving as the central processor with the other dedicated entirely to handling videodisplay functions. The third one, a 4-bit microprocessor (a Fujitsu 8841), handles keyboard scanning. This division of labor means that the main processor is somewhat less taxed than in single-processor designs. This shows up in speed. The FM-8 was the fastest of the six computers reviewed here in a BASIC benchmark test that will be described later.

The main bank of random-access read/write memory is composed of eight 64K-bit memory chips, yielding 64K bytes. An additional 48K bytes of memory store the high-resolution video bit map composed of twenty-four 16K-bit chips.

Also taking up a significant area on the printed-circuit board (in the lower left-hand corner) are 16 integratedcircuit sockets, visible in all their bright-blue glory in photo 14. These were empty in our unit, but are intended to hold up to 16 ROM (readonly memory) chips. These ROMs provide the FM-8 with an amazing capability-an extra character set of 8500 characters! Approximately 8000 of these are Chinese-derived kanji characters; the remaining 500 include complete alphabets (uppercase and lowercase) of Cyrillic (used for Slavic languages, including Russian), Greek, Roman, and hiragana characters, plus some special symbols. Due to the intricate detail of the kanji pictographs, the auxiliary characters are formed in a 16 by 16 dot matrix, and are thus roughly twice the size of the ordinary characters. This character set is accessed from BASIC with the PRINT (x,y), A statement, where A is the hexadecimal address in ROM of the character desired; a table in the user's manual gives addresses for all the characters. Presumably, you could make your own ROMs containing characters for Arabic, Hebrew, APL, or whatever you like!

And if three microprocessors aren't enough, an optional Z80 processor card is available. It appears that this card is required to drive the alternate-

## **Extraordinary Microcomputer Systems** For The Most Demanding Applications

-96-



#### Columbia Data Products' Performance Pleases The Hardest-To-Please.

#### Intelligent Peripherals.

Columbia Data is a pioneer in intelligent RS-232 storage systems for data logging-and store and forward data communications applications. We offer a variety of data storage capacities, access speeds, and microprocessor intelligence in our tape cartridge and floppy disk storage systems with the convenience of RS-232 system compatibility

#### Commander Computers.

Our Commander Computers are integrated desktop systems for industrial, scientific, technical and educational applications. We provide the industry's largest I/O complement, including IEEE bus controllers, RS-232 and parallel interfaces, APU, CTC, 512 x 256 graphics display ... with dual Z-80A microprocessor architecture and a large selection of RAM, floppy disk and Winchester disk storage with CP/M® and MP/M® operating systems.

#### Business Systems.

Columbia Business Systems offer highperformance multi-tasking, multi-user computing systems for distributed processing and data communications. with large shared storage and peripheral selections. Our Concept 1000 can support up to 16 user stations in a true CP/M® and MP/M® operating system environment. Our 1500/1800 Series can support up to five stations.

\*Trademark of Digital Research

#### Home Office:

8990 Route 108 Columbia, MD 21045 Telephone 301-992-3400 Newport Beach, CA 92660 TWX 710-862-1891 Telephone 714-752-5245

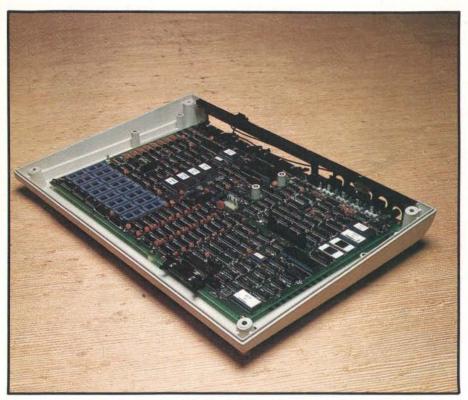
#### West Coast:

3901 MacArthur Blvd Suite 211

P.O. Box 1118 4050 Moenchengladbach 1 West Germany Telephone 021-61-33159

## **COLUMBIA**

DATA PRODUCTS, INC.



**Photo 14:** *Inside the keyboard of the FM-8. Visible in the lower left are 16 ROM sockets for the alternate-character-set ROMS.* 



**Figure 3:** An excerpt from the Fujitsu FM-8 Japanese-language tutorial BASIC manual, illustrating the ON...GOTO statement. The manual contains many such elegant and humorous drawings that are used to teach programming in BASIC.

character ROMs, but it apparently can be used as a general-purpose processor as well, since CP/M and other Z80 software are available for the FM-8.

#### **BASIC** Interpreter

Before we describe the software's capabilities, we want to praise whoever wrote the tutorial BASIC manual. Even though we could not read all of it (our edition is in Japanese), we were impressed by the simplicity and humor with which it teaches programming. (It is reminiscent of Roger Kaufman's A FORTRAN Coloring Book.) It is sprinkled liberally with good programming examples and amusing illustrations, like the one shown in figure 3, depicting the operation of various BASIC keywords. The other two manuals that come with the FM-8 (system-reference manual and BASIC-reference manual) also appear to be quite good (as far as we can tell).

The FM-8 dialect of BASIC (called FBASIC) is in many ways similar to some of the other BASICs reviewed here, supporting most of the same text, graphics, and I/O keywords as the others. It does have a few extra capabilities, however.

Of the graphics statements available, most notable is the CONNECT (x1,y1),(x2,y2),...,(xn,yn) statement. This statement draws a connected line segment through the points indicated, and can be used, for example, to draw polygonal outlines. Since most of the computers reviewed here have a polygon-fill command (PAINT), it is surprising that the FM-8 is the only one with a single command to draw an empty polygon (on all the others, you must use LINE commands in a loop to draw the line segments of the polygon). With the CONNECT command, it takes only two program statements to draw a filled polygon-you CONNECT it, then PAINT it.

Another unique keyword is SYM-BOL, which provides the FM-8 with the unique ability to write multiple-

## II for Apple II

#### **VERSAbox**

The only intelligent SPOOLER/BUFFER with an optional REAL TIME CLOCK interface/display. For use with all Centronics parallel and RS-232C INPUT/OUTPUT interfaces.

VERSAbox's high-speed input combined with up to 60K buffer (more with character compression) frees up your computer from the slow job of printing. Modems and other compatible devices can also be buffered. Multiple softwareselectable outputs permit you to choose be-tween two or more VERSAbox outputs or use them simultaneously. You can buffer multiple inputs simultaneously too.

Add the optional REAL TIME CLOCK to VERSAbox and you get a six digit LED numeric time display. Your computer can read the time via the RS-232C port. Another useful option is the SWITCHED 120V SOCKET that can turn external devices on and off by clock control.

VERSAbox is supplied in an attractive, compact 11" wide, 8" deep, 3" high cabinet. Interface cables are available from your dealer or Prometheus. SPECIAL OFFER for Apple II owners: Buy a VERSAbox this month and you will receive a free parallel interface and cable

VERSAbox, standard model with Centronics parallel INPUT/OUTPUT only and 16K

VERSAbox, with both Centronics parallel and RS-232C INPUT/OUTPUT and 16K \$299.00 buffer

REAL TIME CLOCK option with

#### PLUS VERSAbox FOR EVERYBODY

#### I. VERSAcard

Four cards on one for Apple II. (1) Serial Input/ Output Interface, (2) Parallel Output Interface, (3) Precision Clock Calendar, and (4) BSR Control. All on one card with TRUE SIMULTA-NEOUS OPERATION.

Before you buy Mountain Computer CPS or any other multifunction card, ask these questions:

Can Luse CP/M and Apple Pascal with NO disk modification?

Does it have interrupts?

Will I be able to read and set the year?

Does it have BSR control?

Can I use DB Master? Ascii Express? VISI Dex? Easy Writer? WORDSTAR? Z-TERM PRO? VISITERM? ... other software packages?

If the answer is YES to all of the above, then you're talking about VERSAcard and ONLY VERSAcard. And, the list price has been reduced by \$50 to \$199.00

SPECIAL OFFER: Buy a VERSAcard and we'll sell you GRAFTRIX, a sophisticated screen dump graphics package, with \$25 off the regular list price of \$65 for only \$40.00.

#### II. AUTO-DOC

An automatic diagnostics system for your Apple Il computer. Get a complete check of your critical Apple hardware EVERY time you power-up.

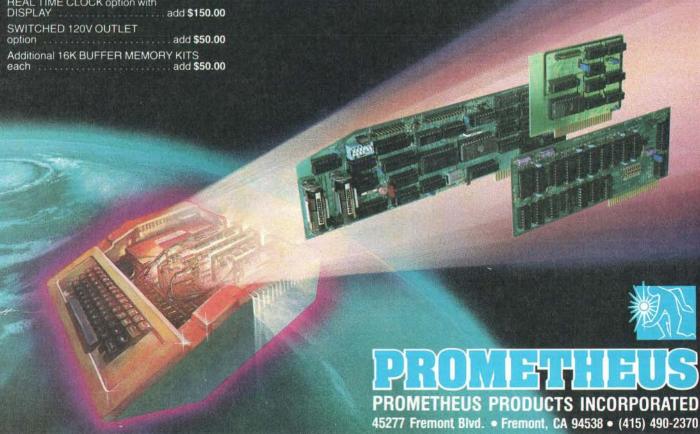
AUTO-DOC saves TIME, ENERGY, and MONEY by identifying problems in your Apple before they make themselves known by system failures. And, you don't have to remember to insert a disk. DOC automatically identifies system problems before you run your programs by doing extensive system diagnostics. If DOC finds a failure, it indicates the problem area and, in some cases, the specific chip or component that's responsible.

DOC includes a memory test, processor test, ROM test, and more. In addition, extensive disk based diagnostics are included for further testing and subsystem checks for many popular peripheral cards

AUTO-DOC is simple and easy to install. And once installed, DOC will always be there working AUTOMATICALLY everytime you power-up.

Can you afford to be without AUTO-DOC?

AUTO-DOC List Price \$99.00



size text. The syntax of the statement with all possible parameters is:

SYMBOL (x,y),string,x-scale, y-scale,color,rotation

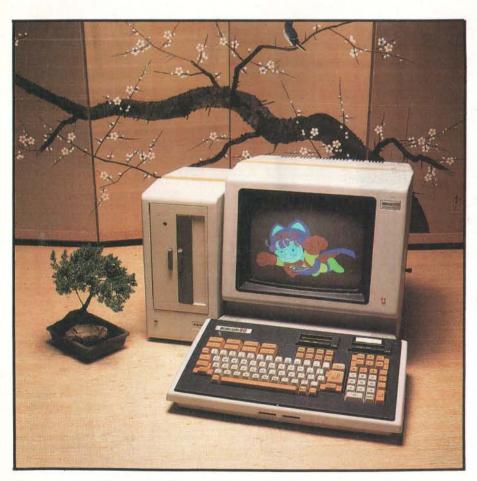
The x- and y-scale factors cause the characters printed to be scaled in size (independently in each axis, if desired) and rotated (by multiples of 90 degrees). This is very handy for labeling graphs, for example.

To assist in programming, FBASIC has a MERGE command, which allows the combining of two or more programs from disk into one large program. Another command bears the somewhat whimsical name of UNLIST. We still aren't sure exactly what this does. Issuing the command UNLIST 50, for example, causes the program currently in memory to become unlistable starting at line 50.

(It still runs normally, though.) Thus, it seems that the command might be similar to the SECURE command on the Canon CX-1. Unfortunately, there doesn't seem to be a way to undo an UNLIST.

Also quite useful is the ANPORT function, which reads an analog input port, does an 8-bit A/D conversion, and returns a value in a BASIC variable.

### Bubcom80



**Photo 15:** The Bubcom80's high-resolution monitor has a contour at the bottom that lets it fit snugly against the keyboard/processor enclosure. Slots in the top of the keyboard enclosure accept bubble-memory cartridges.

Bubble memories—are they the wave of the future or a vestigial remnant of a technological dead end? In the past year, three American manufacturers have pulled out of the bubble-memory business. On the other hand, several Japanese manufacturers are putting bubble memories into personal computers, either as standard equipment or as an option, in what may be either an attempt to stimulate a lackluster market or an anticipation of wonders to come.

A computer that offers bubble memory as a standard feature is the Bubcom80 (see photo 15), a Z80-based machine developed jointly by Fujitsu, one of the Japanese manufacturers of bubble memories, and Systems Formulate Corporation, a company founded by former Fujitsu employees with that company's encouragement and blessing.

But bubble memory is not the only attraction of the Bubcom80. Let's take a look at some of its other virtues first.

#### Hardware

The main keyboard/processor module offers a remarkable collection of features for the price. It has all the features that are standard on the Japanese computers: separate numeric and editing keypads; user-programmable function keys; RS-232C serial interface; and Roman, katakana, and graphic input. It also



**MODEL GB75©** Typewriter Interface

Apple to IBM Electronic 50, 60, 75 Typewriters Interface Reads IBM keyboard in parallel with Apple keyboard - Supports the IBM code functions using an escape sequence Types at about 13 characters per second Prints from Integer or Applesoft programs 
Supports the "Control I Number N" parallel line length mode se-quence • Has switch selectable upper/lower case I/O 60, 56, 78 continuous from feed page lengths, 40+video, 80, 95. 132 character line lengths

Suggested price

\$225.00

#### TIMECARD III®

Multi-function time utility for the APPLE III computer system. Contains the year of the century, he month, the date, the day of week, the hour, the minute, the second. 

A countdown timer with a range of one millisecond o 999 hours, 59 minutes, 59 econds. 999 milliseconds Selectable 12 or 24 hour time ormats Diagnostic error reporting • Fully compatible with the APPLE SOS operating system

Suggested price

Circle 429 on inquiry card.

**MODEL 150 TYPE AHEAD BUFFER** 

■ Up to 40 character type ahead capability - Enter commands or data while your Apple is processing previous instructions Compatible with all Apple computers, keyboards and software No cuts - no jumpers - no software patches required Includes complete instructions for quick and easy installation

\$49.95

Suggested price

#### A800® FLOPPY DISK CONTROLLER

■ High speed DMA transfer of data (1 micro-second/byte) Documentation provided - includes theory of operation, schematics and diskettes Uses all standard Apple DOS commands (OPEN, CATALOG, LOCK, DELETE, LOAD, etc.) except for INIT which has been improved and enhanced in a Vista format routine - Compatible with Apple DOS 3.3, Pascal 1.1 and CP/M 2.2 (with the Z80 soft card by Microsoft) ■ 2K x 8 PROM contains Autoboot functions and all eight-inch floppy driver code allowing complete compatibility with Apple DOS 3.3

Suggested price \$595.00

#### PROM DEVELOPMENT **SYSTEM®**

■ Menu driven program development monitor - Programs 2708, 2716, 2532, 2732and 48016 EPROMS ■ Simulates PROM from RAM 4K Data and address interface for operator location and control . Complete user documentation

Suggested price \$495.00

#### VISION 80

Full upper and lower case character with 3 dot descenders 9x10 dot matrix per line U.S. (9x11 Europe) ■ 128 ASCII character set BASIC, FOR-TRAN and Pascal languages supported ■ Z80' and CP/M' comtible . Compatible with all standard Apple™ peripherals

COMPUTER COMPANY, INC.

\*Copyright 1981 Vista Computer Company, Inc.

Shift and lock for upper and lower case Source switches between 40x24 and 80x24 software and hardware 
Rated #1 video card by Softalk and Call **Apple** 

Suggested price

\$395.00

#### VISION 40

Softscreen programmable character/generator card for the Apple II computer . Allows use of DOS tool kit upper/lower case character sets in Apple 40 column mode Permits creation of new alpha/numeric and graphic characters under Aminatrix Ideal for non-English language applications Compatible with most popular word processing software pack-

Suggested price \$195.00

#### VISION 20

■ Cost effective ■ Compatible with the latest Apple II Complete easy to follow installation guide # 120 day warranty Immediate delivery

Suggested price

1317 E. Edinger Santa Ana, CA 92705 (714) 953-0523

Digital Research, Inc.

Designed by Burtronia

#### At a Glance

Name

Bubcom80

Distributor

Systems Formulate Corporation, U.S.A. 231-E South Whisman Rd. Mountain View, CA 94041 [415] 969-7499

Dimensions (Inches) 3% by 17% by 121/4

Microprocessor Z80, 8-bit

Size of User Memory 64K bytes

Number of Keys

Number of Function Keys 8 definable, 8 defined

Standard Interfaces

RS-232C; audio-cassette tape; monochrome video monitor; RGB color monitor; printer; expansion bus; joysticks; two bubble-memory controllers Optional Interfaces

Floppy-disk drives; high-resolution graphics

**Expansion Sockets** 

1 (systems bus)

**Character Sets** 

Roman, katakana, user-definable graphics

Graphics/Color Resolution

160 by 100 (standard); 640 by 200 (optional)

Number of Colors

8

Other Features

Time-of-day clock with battery backup; speaker with music macroinstructions

Prices

Keyboard/processor \$1550 RGB color monitor \$1400 (with expansion box) Disk drive \$1275 I + \$450 for interface

offers a set of eight keys for singlekey entry of system commands (LABEL, FILES, INIT, STOP, CLS, EDIT, LIST, and RUN).

Connectors are included for both a light pen and joysticks. The numeric keypad, in addition to the 10 digits, includes a 000 key to facilitate the entry of large numbers. A loud-speaker can produce tones (with pitch manipulated by instructions written in a sort of sublanguage similar to the BMC's MML) to provide rudimentary music. And, of course, it has sockets for bubble-memory cartridges. One socket comes as standard equipment; the second is a \$175 option.

The keyboard enclosure is a little larger than the keyboard itself, measuring 44.5 by 10 by 30.5 cm (17½ by 3% by 12 inches). Except for a sheetmetal bracket on the rear, which houses the power supply, the enclosure is all plastic. Apparently, its interior has been sprayed with conductive paint to provide electromagnetic shielding. If you push in two plastic tabs under the front edge of

the enclosure, you can tilt up the keyboard for access to the circuit board inside.

Space inside the case is understandably tight. The main printed-circuit board holds the Z80 microprocessor and associated circuitry, 64K bytes of main memory, the read/write mem-

## Bubble memory is not the only attraction of the Bubcom80.

ory for the user-definable graphic-character set, a counter-timer integrated circuit, various interface chips, and some rather large custom integrated circuits, whose function we are unsure of. A small area (about 2.5 by 7.5 cm, 1 by 3 inches) of largely unused plated-through holes in the board is something that an ambitious user might be able to use for patches or custom circuitry.

Three other circuit boards are

suspended from the keyboard backplane. Two of these are attached to sockets for the bubble-memory cartridges; the third contains circuitry that we assume scans the keyboard and/or operates the bubble memory. One of the mystery circuits on the board is an 88-pin monster with two rows of pins along each side of a square package.

#### Software

The Bubcom80 can use nearly all 64K bytes of its memory-address space for read/write memory because, aside from its bootstrap loader, no ROMs for a BASIC interpreter or an operating system are taking up address space—you must boot the system by loading the operating system and interpreter into user memory either from bubble memory or from cassette tape or disk storage. This, of course, gives more software flexibility than the ROM BASICs-a sophisticated user who wants to run assembly-language programs or some language other than BASIC need not sacrifice address space to a BASIC interpreter.

The system we tested came with two versions of BASIC. The standard BASIC, which apparently does not support some of the high-resolution graphics features, left 29,710 bytes of memory free; the extended BASIC, which does support the high-resolution graphics, left 23,610 bytes of memory free. The system specifications indicate that the CP/M operating system will also be available for the Bubcom80, although we did not have a copy.

The extended BASIC (yet another Microsoft product) has several particularly useful keywords (see table 5).

The most notable one is MENU—a real boon to anyone who wants to write programs with menus for selecting options. It allows a program writer, with a single statement, to display a menu of labels anywhere on the screen. When the statement is executed, the labels are displayed on the screen and the cursor blinks on the bullet in front of the first menu item.

## Good Compa for a Hard Disk

Hard disk usage is starting to boom. Computer owners are demanding instant output and more flexibility in order to take advantage of today's advanced computers.

Great Plains Software, in anticipation of these growing needs, created a comprehensive hard disk accounting/management system for progressive businesses who expect to grow.

PS GREAT PLAINS"SOFTWARE HARDISK ACCOUNTING SERIES

Immediate response at your fingertips - a complete data base of every journal entry posted during fiscal year, CRT display of accounts payable, accounts receivable, customer and vendor records. Other features include budgeting, payroll, inventory, plus much more. Great Plains Software systems expand with your company. Built-in password keeps all information private and confidential. Documentation manual includes easy to follow step-by-step procedures. Screen display/ manual cross reference simplify operation.

Great Plains Software is designed specifically for businesses requiring in-depth results today and anticipate a growth potential in the

Your computer store has the details on Great Plains' advanced hard disk software systems - or for personal service, call (701) 293-8483.

#### OVERALL

- Password privacy system standard
- Written in UCSD Pascal\*
- Hard disk oriented \*TM UC Regents

#### G/L

- All entries on line entire fiscal vear
- Flexible format financial statements
- Comparative income statements

- Up to 9999 customers
- Profit by customer, customer type, salesman and state
- Open item or balance forward
- Instant screen inquiry - Automatically posts to G/L

- Up to 9999 vendors
- Instant screen inquiry
- Automatically posts to G/L

#### PAYROLL

- Up to 9999 employees
- Up to 25 deductions per employee
- Withholding computed
   Prints W2, 941 & checks

#### INVENTORY

- FIFO, LIFO, standard cost, weighted moving average or serial number valuation
- 5 price levels per part
- Concise report including profit by part and line
- Point of sale "cash register" program included

Advanced Software Systems for Today and Tomorrow



**Great Plains Software** 123 15th Street N., Fargo, N.D. 58102 (701) 293-8483

Circle 187 on inquiry card.

MENU(hor, vert)spacing "label1", "label2"... GOTO Address1, Address2...

MENU(hor, vert)spacing "label1","label2"...GOSUB Address1, Address2...

—Displays a menu of labels, starting at (hor, vert), with number of lines between labels set by spacing parameter. Cursor flashes in front of first label; pushing space bar advances cursor to next line; typing RETURN causes a branch to appropriate address or subroutine.

OPTION BASE 0 OPTION BASE 1

-Specifies the starting value of array indices.

Table 5: Useful Bubcom BASIC statements.



**Photo 16:** The Bubcom color-console/expansion box has slots for four 30.5-cm (12-inch) circuit boards.

If you hit the oversized RETURN key, the program branches to the subroutine or address associated with the first label; if you hit the space bar, the cursor drops down to the next label on the menu. Hitting the space bar when the cursor is in front of the last item on the menu sends it back to the first item on the list.

The BC834 console color video display with expansion box, shown in photo 16, is a bit expensive, but it offers more than most displays. The 40.6- by 40- by 37.5-cm (16- by 15<sup>3</sup>/<sub>4</sub>- by 14<sup>3</sup>/<sub>4</sub>-inch) high-resolution color CRT (cathode-ray tube) sits directly above the expansion box, which connects to the system bus and contains slots for four 30.5-cm (12-inch) circuit boards.

The back of the console has something more computer manufacturers should provide: a switched set of four AC power outlets. Thus, you need not hunt around for extension cords and spare outlets to handle your computer and all its peripheral devices. You plug one cord into the wall and plug everything else into the switched outlets. You can then turn all components on or off together with a single switch.

The bottom front of the BC834 is recessed so that the keyboard/processor module can nestle snugly under the screen. In fact, it *must* fit snugly; the flat cable that connects the expansion unit to the back of the keyboard is no more than 7.5 cm (3 inches) long. This makes the system very difficult to plug together; you need skinny fingers and lots of patience to place the edge connector correctly and push it home.

Both the high-resolution graphics board and the floppy-disk-controller board go into the expansion box. While the connections to the floppydisk board are straightforward, the connections to the graphics board are a little bit complicated-the graphics board plugs into the system bus in front and has two unmarked DIN connectors that poke out through holes in the back of the box. To install the board, you must run one cable from the back of the keyboard to the input DIN connector on one side of the graphics board and run another cable from the output DIN connector to the display input. A few labels on the connectors would be very helpful; as it is, you cannot connect the system correctly without consulting the diagram in the user's manual.

Without the high-resolution board, the processor's output can be connected directly to the display input. This mode of operation provides a graphics resolution of 160 by 100 pixels.

With the extra display memory on the high-resolution board, the resolution is 640 by 200 pixels, and the color of each pixel can be specified individually. The high-resolution display is organized as three separate conceptual planes, one each for red, blue, and green. When you clear the high-resolution screen, the three planes are erased sequentially, rather than simultaneously. The effect can be startling.

The main processor memory provides for a fourth character plane, which allows text to be displayed on top of the graphics plane; the text can be written, scrolled, or erased without disturbing the picture drawn on the graphics plane and underneath. Thus, you can list a graphics program on top of the display it creates to compare cause with effect.

Graphics keywords include PAINT, LINE, and CIRCLE, and a graphics macro language similar to that of the BMC is provided. Some of the graphics operations proceed slowly, particularly the PAINT routine. But the display is bright and luminous—figures drawn against a black background appear to float in space.

## **New direct-connect MODEM Microboard.**

Auto-dial, auto-answer RCA **MODEM Microboard adds data** communications to your board-level computer system.

You don't need a separate modem when you use the new CMOS Microboard MODEM with your board-level computer system.

Just plug it into the Microboard Universal Backplane, connect it to your phone line, and you're ready to transmit or receive data.

FCC-approved for direct connect to phone lines, the CDP18S653

provides auto-originate and autoanswer modes for unattended operation. Other features include:

- 300 baud FDX or 1200 baud HDX operation
- Touch-tone or pulse dialing
- Dial-tone and busy-tone detection for tandem dialing
- Busy-tone detection permits repeated dialing

Ideal for any remote data acquisition applications.

Because our MODEM Microboard offers you the CMOS benefits of low power and -40°C to +85°C operation, it is the ideal solution for gathering data at remote locations.

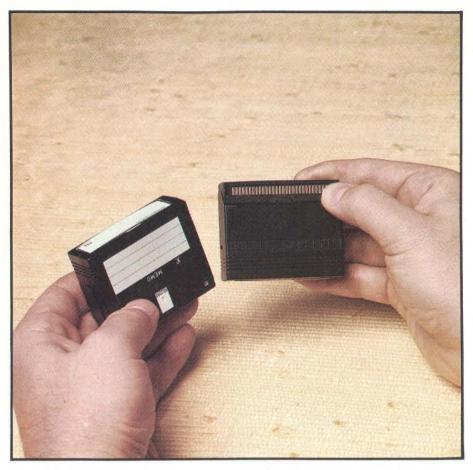
And the MODEM is supported by our large and growing family of CMOS Microboard products and development systems.

So if you want to turn your phone into a data communications center. pick it up right now and call (800) 526-3862.

Or contact any RCA Solid State sales office, representative or distributor.

Circle 292 on inquiry card.

RCA Solid State headquarters: Somerville, NJ. Brussels. Sao Paulo. Hong Kong. Just connect "Old Reliable's" MODEM Microboard to your phone line, and you're ready to transmit and receive data. CDSIV Development Remote Data System Acquisition Computer System Another Microboard System 



**Photo 17:** Each Bubcom bubble-memory cartridge holds 32K bytes. The white slide is a write-protect key.

Floppy-Disk Storage

The Bubcom80's floppy-disk drive, unlike the others reviewed here, uses double-sided IBM-format soft-sectored 8-inch floppy disks. Each disk can hold a whopping 1.2 megabytes, and if one drive is not enough, up to three more can be daisy-chained to the first one. But in spite of its capability, the vertically mounted drive unit takes remarkably little space—it is only 18.4 cm wide, 36.8 cm high, and 40.6 cm deep (7½ by 14½ by 16 inches).

Curiously, a battery-backed-up real-time clock is on the disk-controller board. (When we started the system, the Bubcom80, like the BMC, displayed the correct time, but it was set for the Tokyo time zone.)

#### **Bubble Memory**

What about the bubble memories?

How do they work and what do they do?

The bubble-memory cartridges, shown in photo 17, are black plastic rectangular packages about the size of a small match box-6.0 by 4.5 by 2.0 cm (1.8 by 2.4 by 0.8 inches). On each one is a little white plastic slide switch that can be used to writeprotect the data on the front of each cartridge; a black plastic window at the bottom front of the cartridge covers the metallic contacts on the bottom and slides out of the way when the cartridge is shoved into one of the sockets. You release the cartridge from its socket by pushing a lever on the side of the socket.

Inside each cartridge, circuitry creates magnetic domains—bubbles—and moves the patterns of bubbles along circular loops. The data cannot be accessed in a completely random

fashion, in the way that data in main user memory is. To reach bits at the far end of a loop, you must cycle the intervening data past the read element, just as you must pass over sectors 1 through 15 before you read sector 16 on a disk. But because there is virtually no inertia to overcome when moving the bubbles, the average access time needed to read or write a given set of data is much less for a bubble cartridge than for a disk. (For more information, see A. I. Halsema's article "Bubble Memories: A Short Tutorial," June 1979 BYTE, page 166.)

Since the bubbles remain intact in the medium when power is removed, bubble cartridges can be removed and stored just the way disks can. The bubble cartridges supplied with the Bubcom80 machine we evaluated each hold 32K bytes of data, but Fujitsu, the manufacturer of the cartridges, promises that 128K-byte cartridges will be available in a year.

From the user's viewpoint, the bubble cartridges act just like disks. The software pretends that the two bubble-memory controllers are disk drives 1 and 2; the disk drives are considered drives 3 through 6. All the BASIC commands for disks, LOAD, SAVE, OPEN, CLOSE, etc., work the same for the bubble memories.

Two LEDs, labeled BUSY and READ ONLY, tell you when the bubble memory is in operation and when you are trying to write to a cartridge that is write-protected. The most noticeable difference is the speed of operation. Because there are no motors to start and bring up to speed, and no heads to move, the bubble memories are much faster.

#### Why Use Bubble Memory?

One disadvantage of the bubble cartridges is the price, currently \$175 for a 32K-byte bubble cartridge; standard BASIC in a bubble cartridge costs \$200, as opposed to \$25 on cassette tape and \$50 on an 8-inch floppy disk. Whether the prices come down substantially will undoubtedly depend on how widely used bubble memories become. On the other

## Your guide to the world of microprocessors.

### The Micro-Professor™-A low cost tool for learning, teaching and prototyping.

Here in one attractive package and at a price of only \$149.00 is a Z80\* based microcomputer to lead you step by step to a thorough knowledge of the world of microprocessors.

The Micro-Professor is a complete hardware and software system whose extensive teaching

\* Z80 is a trademark of Zilog Inc.

manual gives you detailed schematics and examples of program code. A superb learning tool for students, hobbyists and microprocessor enthusiasts, as well as an excellent teaching aid for instructors of electrical engineering and computer science

But the Micro-Professor is much more than a teaching device. With it you can do breadboarding and prototyping, designing your own custom hardware and software applications with Z80, 8080 and 8085 compatible code.

The standard 2K bytes of RAM is expandable to 4K, and the standard 2K bytes of ROM can be increased to 8K.

All this plus a built-in speaker, a cassette interface, and

EPB-MPF **EPROM Programming** Board \$169

For all +5V 1KB/2KB/ 4KB EPROMs.

Read/Copy/List/Verify Capability.

**BASIC-MPF** Tiny Basic \$19

2KB BASIC interpreter with hardware control capability. Machine-code subroutine accessible.

Circle 296 on inquiry card.

sockets to accept optional

CTC/PIO. Bus is extendable.

is a great low-cost board for

OEM's. Call for details.

As well as being an exciting

learning tool, the Micro-Professor

SSB-MPF Speech **Synthesizer** Board \$129

vocabulary of up to 400 words based on the TMS 5200 chip.

Multitech Electronics Inc.

☐ Mastercharge Expires

Card No.

Name (Please Print)

Signature

Address

State

Check or money order enclosed

In U.S. and Canada mail to:

Multitech Electronics Inc. 195 West El Camino Real Sunnyvale, CA 94086 California Tel. (408) 773-8400 Elsewhere (800) 538-1542

I'm ready to enter the world of microprocessing

Call toll free to order.

MPF-I Micro-Professor SSB-MPF Speech Synthesizer Board \$129.00 EPB-MPF EPROM Programming Board BASIC-MPF \$ 19.00 Shipping and Handling 4.95 \$ 4.95 California residents add sales tax

Multitech Industrial Corporation 977 Min Shen F Road, 105 Taipei, Taiwan, ROC Tel 02-769-1225 TWX 19162 MULTIC. 23756 MULTIIC

hand, the bubble-memory controllers are much cheaper than disk drives.

The greatest advantage of bubbles over disks is the shorter data-access time. Then, too, in certain environments—abrasive, dusty atmospheres, for example—bubble memories could be expected to be much more reliable than disks. Thus, certain applications exist even today where the bubbles might be preferred to disks. Whether bubble memories

will replace disks in more widespread applications depends on how quickly and how far their prices drop. Nevertheless, the Bubcom80 remains an interesting adventure into this new technology.

## Comparisons

Test	if800 (MBASIC)	if800 (Oki BASIC)	Canon	NEC	Bubcom	Fujitsu	Hitachi
1. FORNEXT	9.7	9.7	15.5	9.4	12.5	8.9	12.8
2. 10 REMs	46.3	22.1	21.5	27.8	30.2	24.0	26.9
3. IF A>B	22.3	23.4	32.8	28.9	30.3	24.2	35.8
4. A + B	23.5	25.1	28.2	25.9	32.4	27.7	40.6
5. A+B	28.9	32.8	47.2	32.3	42.5	30.3	49.8
6. A/B	34.4	40.6	1:15.1	40.8	52.5	38.4	52.0
7. A1B	2:49.3	3:52.2	15:57.6	3:17.5	4:57.1	2:14.8	4:15.7
8. SIN(A)	1:26.0	1:50.0	5:55.2	1:43.0	2:23.5	1:15.3	2:11.1
9. LOG(A)	1:32.3	1:56.7	10:25.0	1:30.4	2:35.6	1:08.4	1:56.9
10. ONGOTO	22.2	23.4	24.6	20.8	30.2	21.1	30.1
11. GOSUB	18.6	15.9	17.5	15.0	19.9	14.8	21.8
12. INT	23.3	25.0	24.8	25.3	32.4	25.8	35.9
13. MID\$	25.3	29.8	31.0	30.2	38.3	28.4	41.4
14. RND	29.6	33.5	2:04.0	31.7	43.5	26.4	43.8
15. CHR\$(X)	21.0	21.6	24.4	21.7	27.9	19.8	32.0
16. Sieve	2:44.5	2:56.7	2:35.3	2:44.5	3:48.9	3:10.0	4:51.8

**Table 6:** Results of the benchmark comparison of the six Japanese computer systems. The tests were run twice on the BMC if800, once with each BASIC interpreter. The simple operations in the left column were repeated 5000 times; the prime-number-finding sieve was the most complicated algorithm in the test.

This completes our individual summaries of the features of the six Japanese computers.

But what about performance comparisons, especially speed of program execution? How fast do they execute the same BASIC program? Since execution speed depends on many different things, such as the type of microprocessor, clock rate, and efficiency of the language implementation, it is not easy to predict how a system will perform in this respect.

To compare these six computers, we ran a comprehensive set of 16 benchmark programs. The results of these comparisons are shown in table 6. Each benchmark tests one feature of BASIC, typically using a program

to do 5000 iterations of a simple operation (such as C = A \* B). The only exception to this pattern is benchmark 16, which is a program to find all prime numbers less than 10,000 using a simple sieve algorithm.

Without attempting to draw too many conclusions from these data, we can safely say that the Fujitsu FM-8 is the fastest of the computers, followed closely by the BMC if800. This is not surprising because of the FM-8's multiprocessor architecture. The Canon CX-1 is usually the slowest of the six, except in a few cases where the Hitachi is slower.

Additional data for comparison can be found in the "At a Glance" boxes accompanying this article.

Data on the floppy-disk drives appears in table 7 on page 102.

#### Conclusions

The Japanese penchant for high quality and flexibility is readily apparent in these computers. The keyboards are durable and have many keys (usually including programmable ones). The video displays are either green-phosphor monochrome or color RGB- (red, green, blue) input monitors for crisp 80-column displays. The standard BASIC interpreters have many language extensions for supporting peripheral devices and usually contain a few abilities not found in most computers.

NOW-Fully Transparent Mass Storage Systems For Your Personal Computer.



The

Graymatter<sup>TM</sup> by III)

Sustems

Brea, California

Transparent Operation—Visible Results.

The graymatter is available in 5, 10, 15 & 20 Mbyte storage systems.

Contact Your Local Computer Dealer for more Information.

Distributed by:



Professional Integration 2701 Saturn Street, Brea, CA 92621 (714) 524-2470

BMC	Canon	Hitachi	NEC	Fujitsu	Bubcom
51/4	51/4	51/4	51/4	51/4	8
2	2	2	2	2	1
2	2	1	1	2	2
?	?	39	34	39	76
?	?	16	16	16	26
?	?	128	256	?	?
280k	320k	81k	139k	328k	1.2M
	olicable	\$1354	\$1295	\$1500	\$1275 \$450
	51/4 2 2 ? ? ? ? 280k	51/4 51/4 2 2 2 2 2 ? ? ? ? ? ? 280k 320k not applicable	51/4 51/4 51/4 2 2 2 2 2 1 ? ? 39 ? ? 16 ? ? 128 280k 320k 81k not applicable \$1354	5¼ 5¼ 5¼ 5¼ 2 2 2 2 2 2 1 1 ? ? 39 34 ? ? 16 16 ? ? 128 256 280k 320k 81k 139k not applicable \$1354 \$1295	5¼ 5¼ 5¼ 5¼ 5¼ 5½ 2 2 2 2 2 2 2 1 1 2 ? ? 39 34 39 ? ? 16 16 16 ? ? 128 256 ? 280k 320k 81k 139k 328k not applicable \$1354 \$1295 \$1500

**Table 7:** Comparison chart of the six units' floppy-disk systems. Some specifications were not known at the time of this writing.

Prices for these computers may seem a bit high, and they would seem higher still if we factored in import and export costs and a less favorable yen/dollar exchange rate. But you must remember that these prices include many capabilities (both hardware and software) that are not standard on most American computers. All these machines, for example, have user-definable function keys and full numeric keypads, in addition to the standard typewriter keyboard. Most of them have simple commands that allow them to serve double duty as a remote terminal for another computer. This should be considered when comparing these machines to other currently available personal computers.

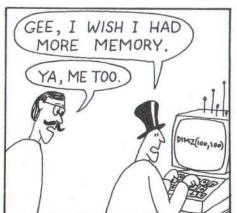
The six computers have a 50/50 split between use of the 6809 and Z80 microprocessors. The Fujitsu FM-8 uses three microprocessors (two 6809s plus a 4-bit 8841). Thus, it has an inherent speed advantage over most of the others. Otherwise, neither the 6809 nor the Z80 machines have a clear-cut speed advantage.

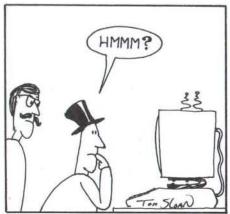
While individual system modules are all well designed, at least some of the manufacturers have paid inadequate attention to how the components fit together. Cables are too short, connectors are difficult to insert and remove, and the systems will not readily fit onto a crowded desk top or laboratory bench. Not everyone wants the display directly behind and above the keyboard.

Because most of the BASIC interpreters (all except Canon's) were written by Microsoft, the versions of BASIC are very similar. It is nevertheless noteworthy that many keywords and features not found in most American machines are common to all Japanese computers. (An exception is the new IBM Personal Computer, which has a Microsoft BASIC system that resembles the ones in the Japanese machines.)

Although we have not really addressed the problem here, it is apparent that one major problem the Japanese manufacturers will have to address in penetrating the American market is documentation. Most Americans have experienced the atrociously translated instructions that come with many cheap Japanese toys and consumer goods, and they are likely to be very critical of instructions that are badly translated or confusing. Money allocated by the manufacturers for producing polished translations of software and hardware manuals would be well spent.

Will Japanese personal-computer manufacturers gain a significant portion of the market in North America? It's anybody's guess. Their prices may be slightly high, but they offer quality, along with a mix of features not found in domestically produced machines. And, as the automakers found, entrenched American competition may not be a significant impediment.■







## LETTER-PERFECT PRINTER DOUBLES AS DATA CRUNCHER.





## Print two ways...correspondence quality and high speed data processing. Now priced under \$2000!

The new T-1805 dual purpose serial printer uses a unique 40 x 18 matrix dot pattern for high quality correspondence printing; or, flip a switch, it uses a 7 x 9 matrix for high speed data processing printing. In the high speed mode, it generates reports at time-saving throughput rates reaching 200 lines per minute. In the reduced speed correspondence mode, its pivoting print head lays down overlapping dots to create a letter-perfect character that looks like it came from an office typewriter.

The T-1805 is the latest evolution in the popular and proven T-1000 series of serial printers. As such, the

T-1805 offers the same quality construction, high reliability, ease of operation and operator conveniences. Plus, for the benefit of the office crew, the T-1805 is exceptionally quiet. Its 53 dbA noise level ranks it as the quietest impact printer on the market.

There's much more to tell, so visit or call your Mannesmann Tally sales outlet today.

Mannesmann Tally, 8301 South 180th Street, Kent, WA 98031. Phone (206) 251-5524.

Printers for the long run.

## **MANNESMANN**

TALLY

JUNE 7-10 BOOTH 6100



# TO BECOME THE LEADER IN TERMINALS, TELEVIDEO HAD TO GIVE YOU MORE.

WE'RE STILL GIVING YOU
MORE WITH OUR NEW
SMALL BUSINESS COMPUTERS.



The new TS 802 business computer



In three short years, TeleVideo became the number one independent supplier of CRT terminals in a very competitive marketplace.

We did it by designing and building terminals with more performance. reliability, features and functions than the competition.

But at a lower price.

Now TeleVideo has entered the even more competitive microcomputer marketplace. And we intend to repeat that success with the same basic philosophy:

By providing big system performance and features. And TeleSolutions a hardware/software package that includes word processing and financial planning software programs.

For a price lower than many of the low performance personal computers.

#### TELEVIDEO'S TS 802 AND TS 802H. THE COMPUTERS THAT **GIVE YOU MORE.**

The TS 802 is TeleVideo's lowest priced computer.

Yet it gives you many more of the important features found only in larger computers costing much more.

· Like modular design for easier maintenance.

 High speed Z80A microprocessor with 64K bytes of RAM main memory enough memory to handle most business applications.

 The CP/M operating system, which is included at no additional cost to give you access to more microcomputer software programs than any other operating system.

 An upward growth path through a unique multiple processor, building block architecture.

 Dual 5¼ inch double density diskettes with a million bytes of unformatted storage capacity.

 A high resolution, non-glare video screen with detached keyboard—just two examples of our innovative, ergonomic computer design.

> Two R232C serial ports for a printer and modem.

 And a high speed port for plug-in expansion to a larger multi-user, multitasking TeleVideo computer system.

But suppose you need more storage. TeleVideo's next model up, the TS 802H, gives you all the same features of the TS 802. But instead of two floppy diskettes, it uses one floppy diskette and a 514 inch Winchester hard disk to give you 10 million bytes of unformatted storage capacity - 10 times the storage for only twice the price of the TS 802.

#### **COMPUTERS THAT GROW** AS YOUR NEEDS GROW.

The TS 802 and TS 802H are more than just single-user, stand alone computers.

When it's time to expand, simply plug them into TeleVideo's more powerful TS 806 or TS 816 multi-user, multi-tasking systems. The TS 802s then become intelligent, fast response satellite stations.

And because each has its own CPU, there's none of the degradation of throughput and contention for a single CPU that slows down the typical shared system. Each user maintains full processing capability in a shared file environment.

With TeleVideo, there's no obsolescence. Because of the unique multi-CPU architecture and TeleVideo's multi-tasking software, the TS 802s do not have to be replaced as your data processing needs grow.

#### **TELESOLUTIONS.™** THE SOFTWARE PACKAGE THAT GIVES YOU MORE.

Instead of offering you just a business microcomputer, TeleVideo is offering a computer and software package called TeleSolutions. And instead of offering you just any soft-ware, TeleSolutions

offers you the most popular, most versatile software: MicroPro's® word processing WordStar™ and business ≽ planning CalcStar.™ Whether you

own a small

business, manage a department in a company, or are your organization's DP manager, the combination of TeleVideo computers with WordStar and CalcStar gives you the quality text editing and financial planning help you'll need. If you do require more software, our CP/M operating system allows you to choose from the widest variety of microprocessor software.

When you buy either the TS 802 at \$3.495\* or TS 802H at \$6,995\* TeleVideo includes WordStar and CalcStar for a special price of \$500 -

a savings of nearly \$300.

#### WORLDWIDE SERVICE.

TeleVideo's small business computers are serviced by a professional nationwide service network, and distributors in the U.S. and in 27 countries abroad.

#### THE BETTER BUSINESS SOLUTION? PROVE IT TO YOURSELF.

Before you begin evaluating business computers make a list of what you'd like one to do for you. Then bring that list to one of TeleVideo's computer dealers throughout the world. Sit down at a TeleVideo® computer. Study the TeleSolutions Package. Even try another computer. Compare the features, the functions, and the performance.

And compare the price.

We don't think you'll find a better business solution than TeleVideo and TeleSolutions.

For more information call toll free 800-538-1780.

## \*TeleVideo

TeleVideo Systems, Inc. Dept.#610A 1170 Morse Avenue Sunnyvale, CA 94086
Please send details on TeleVideo computers and TeleSolutions to:
NAME
TITLE
COMPANY
ADDRESS
CITY
STATEZIP
PHONE # ()

TeleSolutions™ is a trademark of TeleVideo Systems, Inc. WordStar™ and CalcStar™ are trademarks of MicroPro International Corporation.

CP/M is a registered trademark of Digital Research Inc.
\*Prices are suggested retail excluding applicable state and local taxes — Continental U.S.A., Alaska and Hawaii.

Circle 410 on inquiry card.

Northeast Region 617/369-9370; Eastern Region 212/308-0705; Southeast Region 404/447-1231; Midwest Region 312/969-0112; South Central Region 214/258-6776; Northwest Region 408/745-7760; Southwest Region 714/978-6038; European Sales (Holland) 31-075-28-7461

## Japan Update

The semiannual Consumer Electronics Show is on its way to becoming a showcase for new computer products.

Mark Haas Managing Editor

The Japanese, formidable competitors in many U.S. and foreign markets, are making great headway into our domestic microcomputer industry. While a large percentage of components of American-made microcomputers are made in Japan, few microcomputers up until now were actually manufactured by

Japanese companies in Japan. This situation is rapidly changing, however. At the Consumer Electronics Show, held in Las Vegas in January, I previewed several new Japanese entries into the United States market by Casio, NEC, and Toshiba. Some companies were featuring soon-to-be-available machines; others were

just offering a taste of what they'll be showing at next month's National Computer Conference in Houston. (For an extensive report on what the Japanese are up to see "Six Personal Computers from Japan" by Christopher P. Kocher and Michael Keith, page 60, in this issue.)

#### Casio's FX-9000P

Casio has finally released its FX-9000P personal computer (see photo 1) which is based on a Z80 look-alike microprocessor. Running at 2.75 MHz, Casio's proprietary processor is in a rather unique environment. Casio partitioned the user-memory area (32K bytes maximum) into 10 sections. The philosophy behind this decision is related to the way memory is physically added to the machine: in 4K-byte CMOS (complementary metal-oxide semiconductor) RAM (random-access read/write memory) packs with three-year battery backup. You can write programs to a RAM pack and interchange packs for different applications. While this may sound like a useful way of storing programs, keep in mind that each 4K-byte RAM pack costs \$189. Compare this to the Bubcom80's \$175 bubble-memory cartridges, each capable of holding 32K-bytes indefinitely, in a much smaller package.

The FX-9000P uses a button-type keyboard and is limited to 67 keys.



Photo 1: Casio's FX-9000P personal computer was finally introduced at the January Consumer Electronics Show. Using a Z80 look-alike, the basic unit comes with 12K bytes of ROM and one 4K-byte CMOS RAM pack with battery backup. RAM is expandable to 32K bytes, and a 16K-byte dynamic RAM pack is also available. The button-type keyboard contains only 67 keys but allows one-key access to many scientific and statistical functions. The printer is manufactured by Epson.



## SYSTEM BUILDERS: THINK SOLID. THINK PRICE. THINK CCS.

Each month, CCS produces, tests, and ships over 3,000 board-level building blocks. About ten come back for repair. And we're working on that.

## Built like a commodity. Priced like a commodity.

Volume means we keep our prices down. Low prices and reliability mean our customers keep coming back for more.

## High performance that works.

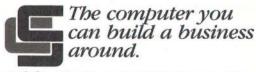
You get all the performance that most systems want. Benchmarks prove it. You get the reliability and low price that all systems *need*.

## S-100 in quantity.

Whether you want to add capability to an existing S-100 system, or build a system from scratch, chances are you'll find a solution in the CCS product line.

Call or write for the CCS S-100 product catalogue.

- 16K STATIC RAM
- 32K STATIC RAM
- 64K DYNAMIC RAM
- SERIAL I/O
- PARALLEL I/O
- FLOPPY DISK CONTROLLER
- HARD DISK CONTROLLER
- Z80® CPU
- PROTOTYPING BOARDS
- MOTHER BOARDS
- MAINFRAME / POWER SUPPLY Z80 is a registered trademark of Zilog Corporation.



California Computer Systems, Inc.

250 Caribbean Drive Sunnyvale, CA 94086 408 734 5811 Telex 171959 CCS SUVL

Circle 65 on inquiry card.



Photo 2: NEC's PC-6000 computer system was introduced recently in Japan and may be brought to this country soon. Shown here is the PC-6001 computer, the Touch Panel graphics tablet, and the data-cassette recorder. The keyboard on the unit shown is of the button type and allows use of an overlay, but NEC is contemplating the use of a keyboard similar to the one used on the PC-8001 before the PC-6001 is introduced into this country. The Touch Panel, expected to sell here for less than \$200, would mark a breakthrough in low-cost graphic input devices.



Photo 3: A close-up view of the PC-6001 as shown at NEC's suite at the Riviera Hotel in Las Vegas. Though the keyboard is of the button type, the feel was very good and not at all toy-like. The gray area surrounding the keyboard is a removable overlay which is very useful in applications where it is necessary to redefine the keyboard. ROM packs can be inserted in the right side of the case, and the speaker opening is visible at the upper left-hand corner of the case. Both the style and layout of the keyboard may change before introduction of the PC-6001 into this country.

The display provides only 16 lines of 32 characters in the text mode but offers 256 by 128 dots on the 5½-inch video display in the graphics mode. The basic unit comes with one 4K-byte CMOS RAM pack, 12K bytes of ROM (read-only memory), and a 4K-byte video RAM.

The FX-9000P includes in its BASIC language many engineering and statistical functions and boasts an accuracy of 12 significant digits. Trigonometric and hyperbolic functions, as well as standard-deviation and correlation-coefficient functions, are built in and can be accessed with single keystrokes. Powerful graphics commands let you easily plot points, lines, curves, and quadrangles, which are useful for a graphics representation of business and scientific data.

Two option boards provide expansion capabilities. The OP-1 (\$379) attaches to the lower rear of the mainframe and contains a cassette-tape interface, clock, alarm, and calendar logic with battery backup, a character printer interface, and a graphics printer interface. Casio designed the graphics printer interface to connect with the Epson MX-82 (an enhanced version of the MX-80 which costs \$1295) and the character printer interface for a yet-to-bereleased exclusive character printer. The cassette interface operates at 300 bits per second (bps).

The OP-2, when released, will enable the FX-9000P to access two single-sided, double-density disk drives and will contain the disk operating system (DOS). The system includes an RS-232C interface.

Prices for the FX-9000P start at \$1199. The 4K-byte CMOS RAM packs are \$189, and a 16K-byte dynamic RAM pack is available for \$129.

## NEC to Introduce the PC-6000?

NEC displayed its PC-8000 computer system publicly at the show, but in its hotel suite, I had a private viewing of the PC-6000 system (see photo 2). Recently introduced in Japan, the PC-6001 is obviously aimed directly at Radio Shack's Color

Computer and Commodore's VIC-20 markets. It contains NEC's version of the Z80 microprocessor, 16K bytes of ROM containing a subset of the BASIC found in the PC-8001, and 16K bytes of RAM expandable to 48K bytes. Made to connect to a color television, the display provides 25 lines of 32 characters and is capable of producing multicolored graphics. You can insert a ROM pack in the right side of the unit (see photo 3), and two Atari-type (nonresistive) joystick inputs allow connection of joysticks or other devices. The system includes RS-232C and Centronics ports and can synthesize music.

The keyboard on the unit I tried was of the button type, similar to the Color Computer's but with a much better feel to it. For applications that redefine the keyboard, you can use a keyboard overlay. Before the PC-6001 is introduced in this country, NEC may change its keyboard to resemble more closely that found on the PC-8001, although with that design you couldn't use the keyboard overlay. NEC still hasn't finalized the exact keyboard layout. The PC-6001 could be expected to sell here for well under \$500.

Of equal significance was NEC's new graphics tablet. Expected to sell for less than \$200, the graphics tablet connects to both joystick inputs, using 6 of the 8 bits of input provided. With the pressure-sensitive surface, you can use practically any writing instrument to trace existing artwork such as maps, or you can create new art directly on the tablet. I also viewed NEC's data-cassette recorder for program and data storage.

## Toshiba Enters Personal Computer Market

Toshiba commanded a lot of attention at the show with the preview of its new T100. Part of the same family as the T200 and T250, the T100 provides a 64K-byte Z80-based computer for less than \$1000. In addition to the 64K bytes of user memory, the T100 (see photo 4) contains 32K bytes of ROM and a 16K-byte video RAM.



Don't mortgage the farm . . . rent all the Intel microcomputer development system power and capability you need off-the-shelf from Genstar REI now. Immediately available for short-term rental (at attractive prices) are virtually every Intellec system and accessory from Intel — including a Network Manager plus a system for evaluating the office of the future, Ethernet; the new Intellec High-Level Language Debugger for all 8086 and 8088 software (P-Scope); and the newest high-performance peripherals — and much, much more. So develop a lot, and save a bundle. Rent from Genstar REI today.

## GENSTAR

## Rental Electronics, Inc. (800) 227-8409

In California (213) 993-7368, (415) 968-8845 or (714) 879-0561



I'd like to save money send  ☐ It sounds great. Tell me more! Call me at	☐ I'm particulary interested in the following equipment:
<ul> <li>□ Send me your new Rental Catalog.</li> <li>□ I'd like a copy of your "like new"</li> </ul>	(1000 C. 1000
equipment for sale catalog, too.	
NAME	TITLE
ORGANIZATION	
ADDRESS	MAIL STOP
CITY/STATE/ZIP	
TELEPHONE	



**Photo 4:** Toshiba surprised everyone when it previewed the T100 at the show. Shown here with the optional flat liquid-crystal display, the T100 is Z80-based and contains 64K bytes of user memory, 32K bytes of ROM, 16K bytes of video RAM, and provision for 32K-byte RAM and ROM packs. Toshiba will be offering Wordstar, dBase II, and all of the Structured Systems Group software, as well as CP/M, when the unit is officially introduced at next month's National Computer Conference in Houston.



Photo 5: The dual 5<sup>1</sup>/<sub>4</sub>-inch floppy disk drive being offered by Toshiba for the T100 is housed in a sturdy steel case containing its own power supply. Each drive is capable of storing 280K bytes, and the basic T100 can support four drives.

The ROM contains Microsoft BASIC, called T-BASIC, and CP/M is available. At the top right-hand corner of the unit, you can insert ROM and nonvolatile CMOS RAM packs with battery backup. Each pack can hold up to 32K bytes.

The T100 has a 90-key keyboard and displays 80 characters by 25 or 20 lines when used with a conventional monitor, or 36 characters by 24 or 19 lines when used with a regular television. Letters are formed in an 8 by 8 dot matrix. The color display can produce black, blue, purple, red, green, light blue, yellow, and white. You can display graphics in two modes: 640 by 200 dots and 160 by 100 dots.

One thing that caught everyone's eye was the optional flat liquid-crystal display, (see photo 4). The LCD pivot mounts on the back of the unit and displays 4 or 6 lines of 40 characters. It is also capable of providing a 320 by 64 dot matrix, which is dot addressable.

The T100 can accommodate up to four disk drives without resorting to use of the expansion unit (which will support four more drives). Two 5½-inch drives, each capable of storing 280K bytes on a 5½-inch floppy

disk, are housed in a sturdy metal enclosure (see photo 5) which also contains a power supply.

The T300, an 8088-based unit operating under MP/M and supporting from one to four users, was not on display at the show but is scheduled to be at the National Computer Conference in June. Toshiba

The T100's optional, flat liquid-crystal display caught everyone's eye. It can display 4 or 6 lines of 40 characters.

will sell the basic T300 for \$1500 and a full-blown four-user system, employing a hard disk, for up to \$20,000.

### Rumors

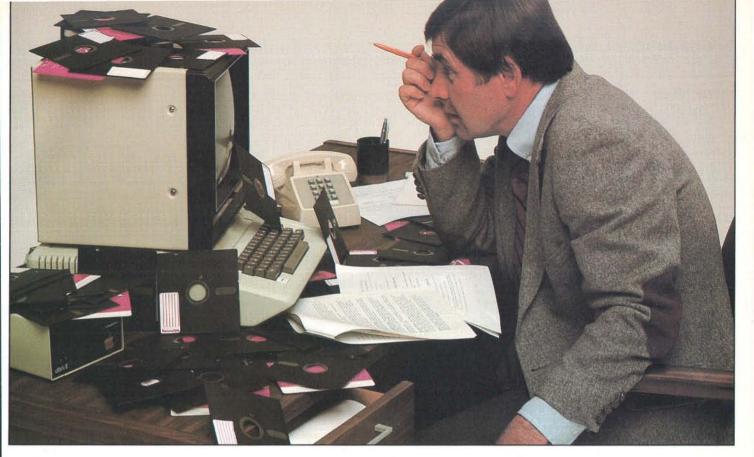
Reliable sources indicate that NEC is about to introduce an 8086-based all-in-one computer that will employ Digital Research's CP/M-86. Although it's still unofficial, I wouldn't be surprised if NEC were to preview the unit at one of the na-

tional computer conferences in late spring or early summer. NEC in the past has used a similar approach of previewing its computers such as its PC-8000 system before officially announcing them as viable products on the U.S. market.

Hitachi is planning to introduce a 16-bit computer by year's end. Now being completed in Yokohama, the design will most likely include a 68000 microprocessor operating under the new CP/M-65K. Digital Research is developing this new version of its ubiquitous operating system for release in June. Hitachi considered incorporating the 8086 in its new machine, but the availability of CP/M for the 68000 assures Hitachi of a broad base of software.

## More to Come

This by no means covers the range of computer products we can expect to see from Japanese manufacturers this year. Phil Lemmons's article "The Machines Behind the Machines" on page 114 in this issue will bring you up to date on who will be the driving forces behind these new products. The Japanese have been carefully studying the U.S. market and are clearly ready to step right in.



## We don't make a Winchester for just anybody.

We're Corona Data Systems and we've made Starfire, a Winchester disk just for Apple II\*.

What's in it for you?

5 million characters of storage. And that's not all. You'll get Corona's Disk Partitioning which allows for up to 16 separate operating systems such as Apple DOS, CP/M\*and Pascal, all sharing the same disk. Of course, you'll still be able to use DB Master\*and protected software like VisiCalc\*.

## **Double Size Volumes.**

And with our Double Size Volumes, your Apple DOS is transformed into something special that offers larger data files. And you'll never have to type commands like "catalog"

and "run" or type program names again. You can even forget what volumes the programs are in.

## Reliability.

But you'll never forget Starfire's reliability. That's because we built DataGuard,



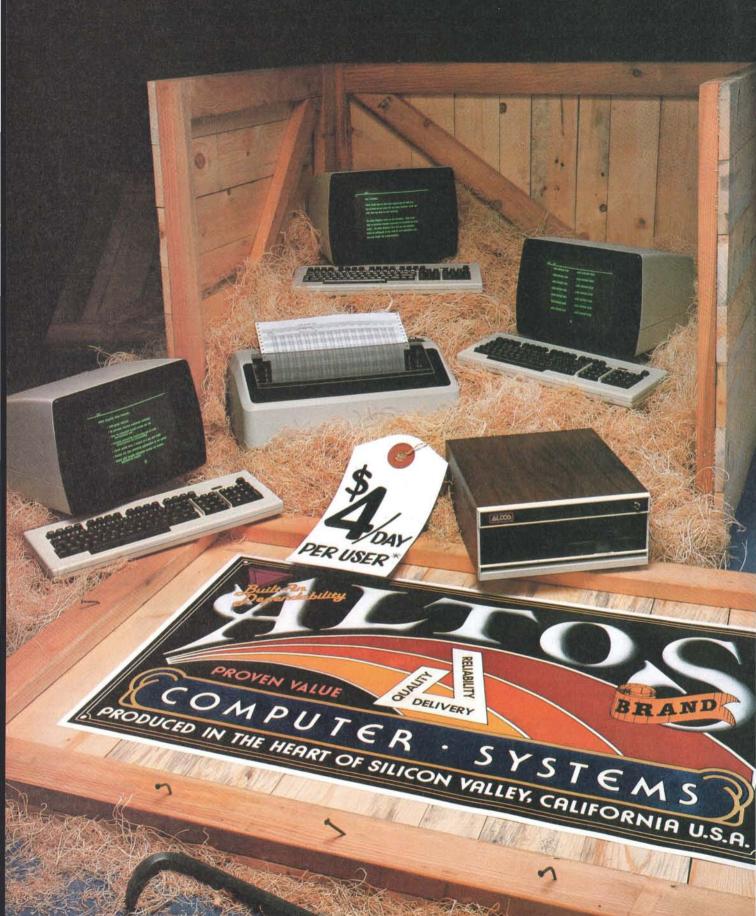
the feature that will correct errors, not just report them. And we also provide a one-year warranty that you can count on. That's reliability.

So why take chances? With Starfire, you're not just adding a hard disk to an Apple II, but transforming an Apple II into a full hard disk business computer.



21541 Nordhoff Street, Unit B Chatsworth, California, 91311 (213) 998-0505 Circle 121 on inquiry card.

Starfire – the Winchester disk made just for Apple II.



## OPEN FOR BUSINESS... THE NEW ALTOS ACCOUNTANT.

Introducing the complete multi-purpose, multi-terminal desktop business accounting system with a built-in tutor.

Get everything you need to computerize your business. An ALTOS® Series 5 computer (including 5 MByte Winchester hard disk and 1 MByte floppy), three of our new smart terminals and a printer.

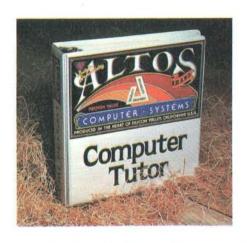
You also get the new ALTOS ACCOUNTANT, a completely integrated business accounting system that includes applications for general ledger, accounts payable, accounts receivable, inventory control, payroll, job costing and order processing.

There's more. You get the unique ALTOS COMPUTER TUTOR, the self-teaching tutorial that provides simple, self-paced, step-by-step training that makes using

the computer easy.

Best of all, you get everything for less than \$4 per day per user.\*
Complete hard disk systems start at \$9,980.

An Altos system is like having three computers in one. For example, while your bookkeeper prepares payroll, other users can check inventory, compute cost estimates or produce reports. All at the same time.



Need more? You can choose from hundreds of popular CP/M® and MP/M II " applications like word processing, business planning, and communicating with other computers or networks. There's also nationwide on-site service available from your dealer.

Join the thousands of businesses that already rely on Altos. For more information, call our toll free number or write: Altos Computer Systems, 2360 Bering Drive, San Jose, CA 95131. We'll put you in touch with your local Altos sales and service dealer who'll introduce you to your very own ALTOS ACCOUNTANT.

Packed with fresh ideas for business



800-538-7872 (In Calif. 800-662-6265)

\*Complete 3 user system for \$4 per day per user. Price approximate and may vary in your area. Daily lease based on \$12.800 principal, 20% annual interest, five-year term. Packaged system includes Altos Series 5-5D computer with 5 MByte Winchester hard disk and 1 MByte floppy, a draft quality printer, three Altos smart termias, and the ALTOS COMPUTER TUTOR software package. Price does not include tax, installation, additional training and maintenance.

ALTOS is a registered trademark of Altos Computer Systems.

CP/M is a registered trademark and MP/M II is a trademark of Digital Research, Inc.

\*1982 Altos Computer Systems

Circle 17 on inquiry card.

## Japanese Computers



## The Machines Behind the Machines

Several Japanese companies, both large and small, have their eves on the American market.

## Phil Lemmons Consulting Editor

When shopping for the products of any rapidly developing industry, you must judge not only the products themselves but also their manufacturers. This is especially true when products are complex. If you buy the world's greatest microcomputer from a company whose business acumen falls far below its engineering genius, that company may not be around two years from now when you need parts or service for the machine. You want to buy a machine from a company that will continue to produce and support microcomputers. When you buy, you're betting on one company to survive.

The temptation is strong to buy only from the largest companies, but that oversimplifies the judgment you must make. Size is, of course, important. Companies that hope to survive in the American microcomputer market must now be able to stand up to giants such as IBM, DEC, and Xerox. Big companies can also achieve economies of scale and further economies by making most or all of

their products' components (which economists call vertical integration).

Just as important as a company's size, however, is its determination to continue making microcomputers. Industry pioneers such as Apple Computer Inc. will be formidable competitors because everyone believes their manufacture and support of microcomputers will probably continue. If some huge, diversified company introduces a microcomputer that fails to win a good share of the market, that company can stop making microcomputers and rely on its hundreds of other products.

This article doesn't pretend to judge the contenders in the battle for survival in the U.S. microcomputer market; it's purpose is to profile some Japanese companies, including Canon, Oki, Fujitsu, Hitachi, NEC, and Systems Formulate Corporation. (For a comparative review of these companies' microcomputers see "Six Personal Computers from Japan," page 60 in this issue.) To help you put this information in context, I'll first give some information about the microcomputer industry in Japan and about Japanese pricing policies in the United States. I'll close with a few speculations about Japanese microcomputers in the United States during the next two years. These speculations must be considered strictly amateur.

## The Japanese Microcomputer Industry

The Japanese microcomputer industry is large and diverse, but two generalizations apply: the graphics are excellent, and the competition is fierce. The graphics are excellent because they must be in order to represent the complex kanji (Chinese characters) used in Japanese. The competition is fierce because manufacturing personal computers appeals to two different kinds of Japanese companies: the long-standing manufacturers of computers and the consumer electronics firms.

Sixty-four companies manufacture personal computers in Japan. (Sixtyfour; this is not a misprint. Clearly, the Japanese are finding ways to occupy the 40,000 electrical engineers who graduate from Japanese universities each year.) At least eleven Japanese companies are already marketing microcomputers in the United States: Canon, Casio, Seiko (Epson), Fujitsu, Nippon Electric Company (NEC), Oki (through BMC), Panasonic, Sharp, Systems Formulate, Toshiba, and Hitachi (the last delayed by the FCC's changes in rules governing radio-frequency interference). Sanyo and Sony are in the wings, and others are in their dressing rooms.

Computer Manufacturers

The Japan Electronics Almanac 1981 lists six major manufacturers of computers in Japan: Fujitsu, Hitachi, NEC, Toshiba, Mitsubishi Electric, and Oki Electric Company. These companies have experience in developing integrated computer systems and software. Oki is by far the

We know less about the intentions of the Japanese consumer electronics manufacturers than we do about the major computer manufacturers.

smallest with "only" 12,000 employees compared to Fujitsu's 34,000 and Mitsubishi's 49,000. NEC employs 64,000; Toshiba, 98,000; and Hitachi, 151,000.

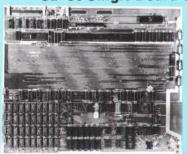
Each of these major manufacturers has the resources to make a dream machine. The question is, can they effectively market their microcomputers in the United States?

Fujitsu has the least experience in consumer electronics and has shown a tendency to market its machines through OEMs (that is, to have its machines packaged and sold under the names of other original equipment manufacturers). NEC markets consumer products widely in Japan but not in the United States. On the other hand, NEC has outpaced the other companies in entering the American microcomputer market, Like NEC, Oki has also sold peripherals here, notably its Okidata printers, and is marketing small-business computers through the Japanese trading company BMC (Business Machines Corporation) and BMC USA Inc., its American subsidiary.

Various sources claim that 8086- or 8088-based microcomputers will come from Toshiba, NEC, Hitachi, and Fujitsu. If these rumors are true,

## "THE BETTER BOARD"

SB-80 Single Board Computer



## Z-80-A 64K RAM

Fully Assembled and Tested

Size: 16" x 13" Same as 2 8" floppy drives. Requires: +5V 1.5 Amp -5V 1.0 Amp +12V 1.5 Amp

\$695.00\*\*

### CONSTRUCTION

- Sockets for all integrated circuits.
   50 pin connector allows access to system for future expansion.
- PROCESSOR
- Z80A with 4 MHZ system clock with no wait states.

### MEMORY

- 64K of 200ns dynamic RAM is standard, 4116 IC's
- · Parity protection is standard.

### ROM

256 bytes bootstrap ROM

### 2 PARALLEL I/O's 2 SERIAL I/O's COUNTER TIMERS FLOPPY DISK CONTROLLER

### OPTIONS:

- Character video board 80 x 24 for use with black and white monitor using a stand alone
- keyboard ..... \$215.00
- Winchester Host Adapter board for Shugart SA-1000 or Corvus Hard Disk. Includes cables .... \$315.00



18" W x 19" L x 8" H



## CPU — DISK DRIVE CABINET ACCOMMODATES:

- SB-80 BRI 2000
- . DIGITAL RESEARCH "The Big Board"
- OTHER SINGLE BOARDS

Metal cabinet with proportionately balanced air flow-convection cooling. AC power cord connector; lighted power switch; Fuse assembly; 0.65 Dual drive power supply (Will also power single board CPU). All hardware included to mount 2, 8" disk drives. Includes space area to mount any single board computer. Fully assembled and tested.

 SB —
 Cabinet Kit \$645.00

 SB—
 Bare Cabinet \$145.00

## SS/DD DISK DRIVE SYSTEM SB Assembled tested with 2, 8°

## DD/DD DISK DRIVE SYSTEM SB Assembled tested with 2.8"

drives ......\$1850.00

## 8" FLOPPY DISK DRIVES

CP/M\* 2.2 & BIOS

CP/M\* 2.2 & BIOS modified by S & M systems to run on single board is available for

... \$200.00

HOW TO ORDER Phone orders using American Express, Visa, MasterCharge, Bank wire transfer, Cashier's or Certified check, Money Order, or Personal check (allow 10 days to clear). Please add 5% for shipping, handling and insurance minimum \$500.00. Conn. residents add 7.5% sales tax. All equipment is subject to price changes and availability without notice. All equipment is new and comes complete with manufacturers warranty. Showroom prices may differ from mail-order advertisement.

\* CP/M is a trademark of Digital Research Corp

\*\* 1 to 4 piece domestic U.S. price



Colonial Data Services Corp.

105 Sanford Street Hamden, Conn. 06514

(203) 288-2524 • Telex: 956014

## Expand Your IBM PC

## ☐ Memory Expansion Board

Datamac's Expansion Board offers 4 TIMES the amount of memory offered by the IBM PC. Configurations can be set at 64K, 128K, 192K and 256K bytes. Board can be easily upgraded in 64K capacities.

## □ Add-In Winchester Disk System

Datamac's Add-In Winchester System is housed within the IBM chassis and is easy to install directly into the floppy disk slot, reducing desktop space. Winchester Controller Board is available for the larger OEM users.

## Asynchronous Communications Controller

1 or 2 line capability on one card.

Totally compatible with IBM software and diagnostics.

See your Computerland Dealer for the ever growing line of Datamac Peripheral Products for the IBM Personal Computer.



## The Japanese Manufacturers—How Successful Will They Be?

by Tod Zipnick TMO Software Inc. 390 Northeast River Rd. DesPlaines, IL 60016

America has long awaited the Japanese entry into the U.S. personal computer market. Some Japanese companies have already begun to sell microcomputers here, and more are surely on their way. But a few questions remain unanswered: How successful will the lapanese companies be? What are their plans and what products can we expect from them?

Japanese companies will have to go through a two- to three-year learning curve to understand the American microcomputer market. For one, Japanese methods of conducting business are different from ours. As well, they might encounter problems stemming from a less than thorough understanding of microcomputer distribution, service, and support, FCC regulations, and software and its support.

## **Japanese Methods** of Conducting Business

When Japanese engineers consider the design of a new product, they accept advice mainly from divisions within their company that have been successful in the past. Because their experience at this point stems from the Japanese rather than the American marketplace, new products are often designed with Japan in mind, not America. The market for microcomputers in Japan is several years behind ours. This explains why one Japanese company can plan to release a cassette-based microcomputer with no means to interface it with a disk drive. The Japanese market will accept such a product,

## About the Author

Tod Zipnick is president of TMQ Software, a Chicago-based software and consulting firm to the microcomputer industry.

but the same product will find much resistance in America.

lapan is several years behind us in software capability. They know hardware better than software. Japanese products reflect this lack of knowledge; consequently, their computers are hardware-intensive rather than software-oriented. The hardware is nonetheless very good.

## Distribution, Service, and Support

Microcomputer distribution, service, and support are also different here. The Japanese marketplace still contains a lot of hobbyists, and only recently in Japan has there been a transition to the business marketplace—a transition we experienced several years ago. When an American business plan is presented for Japanese approval, the lapanese are naturally skeptical about the distribution, service, and support based on their experiences in Japan. They do not yet understand the amount of money needed to support these functions in the American marketplace.

## **FCC Regulations**

Having to pass a microcomputer through the FCC for approval is a new experience for the Japanese. Because of this, the Japanese manufacturers will spend a lot of time getting approval for their first line of products. In an industry that moves as fast as this one, such a delay could hurt their marketing plans. Future designs for new products will undoubtedly be passed through more quickly.

## Software

One of the biggest lessons the

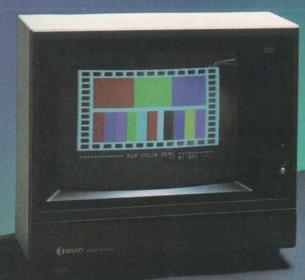
Japanese companies will have to learn is that software sells hardware in America. A Japanese company will look at the third-party support of the Apple, Atari, Radio Shack, and IBM computers and expect the same to occur for their machines. What they may not realize is that they will have to commit \$1 to 3 million to acquire software applications from outside vendors to do the job properly. A lot of money needs to be poured into software evaluations and support of software when it is released. This must be done in America, not in Japan, because the people working in Japan are not aware of the software options available through companies in the United States. At this time, very few Japanese companies have allocated the necessary resources in America to carry out these steps.

For software development, Japanese companies must lend between 50 and 100 machines to software companies. This often adds up to more money than most Iapanese companies at first realize is necessary to push a product onto the market. Technical documentation on a system is also very difficult to get from Japanese manufacturers. The time and money needed to produce these documents is a must if software companies are going to support a machine.

We can expect Japanese manufacturers to make many mistakes when they first enter the American market. Remember, however, that American manufacturers had similar problems in the past. As the Japanese learn, and if they remain committed to the U.S. market, we can expect to see some fine products from Japan in the future.

## **ALPHANUMERIC or GRAPHIC?**

If high resolution required, install BMC color/green monitor in your system.



BM-1401RGB



**RGB** Interface Board for

Apple-II is available now.

**BM-12A** 

12" Green P4 Phosphor CRT Composite Video Signal 80 Char × 24 Lines

BM-1400CLU

13" Composite Video Signal
40 Char. × 25 Lines

13" RGB Separate Video Signal
5 × 7 Dots, 40 Char. × 25 Lines

BM-1402RGB 13" RGB Separate Video Signal 5×7 Dots, 80 Char, × 25 Lines

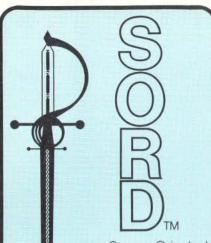
Circle 48 on inquiry card.



20610 Manhattan Place Suite 112, Torrance, CA 90501 Telex: 698641 BMC USA TRNC Phone: 213-320-9880, 9881

**NEW YORK OFFICE** 

450 Barell Avenue, Carlstadt, N.J. 07072 Telex: 133221 BMC NY CARL Phone: 201-939-7079, 7061 Circle 218 on inquiry card.



a Screen Oriented Relational Database, designed to put You in control of a powerful information management system: quickly, easily, and at a price you can live with.

### **Powerful**

- User defined CRT entry screens speed data input and editing
- •Makes full use of CP/M 2.0+ facilities for rapid access and retrieval.
- User controlled security access codes.
- Up to 32k records per relation with up to 8k per record.

## **User Oriented**

- A consistent system of help messages, menus, and prompts assits the user in all phases of operation.
- An English-like query format that is easy to use yet comprehensive.

### Clear Documentation

 Our manual is concise, easy to understand, and indexed.



VISA, MC and COD welcome



(313) 996-1890

REQUIRES: CP/M 2.0+SYSTEM WITH ATLEAST 42K, 64-80 COLUMN SCREEN. ADDRESSABLE CURSOR AND 8" DISK

\*CP/M is a trademark of Digital Research, Inc.

## Japanese Computers

the Japanese computer companies seem to be swarming around the chips of Intel design. This phenomenon is probably based on a desire to capitalize on the large base of software that already exists for these products.

Only Toshiba, NEC, and Hitachi are significant manufacturers of both computers and consumer products. Only Toshiba and Hitachi have marketed their consumer products on a large scale in the United States.

## Consumer Electronics Manufacturers

Sharp, Sony, Matsushita (Panasonic and Quasar), Casio, Sanyo, Seiko, and Canon have all been successful in marketing consumer electronics in the U.S. These companies know the American consumer market and have impressive distribution and service networks. The demands of the consumer markets for small batterypowered gadgets have made these companies invest heavily in semiconductor research. Sharp and Seiko, for example, have spent millions on developing advanced low-power CMOS (complementary metal-oxide semiconductor) chips. Those chips and their descendants will form the basis of remarkably small, portable, batteryoperated microcomputers.

As to the sizes of the companies themselves. Matsushita employs 96,000 people and had semiconductor sales of \$254 million in 1981 (double the sales of Texas Instruments). Sony employs 33,000 and has annual sales of around \$5 billion, Sanyo employs 19,000, and Sharp employs 18,000. Canon is a \$2-billion company. Seiko is a privately held \$3-billion com-

We know less about the intentions of the Japanese consumer electronics manufacturers than we do about the major computer manufacturers, but the consumer electronics companies are clearly interested in the American microcomputer market. Sharp makes the YX-3200 business-oriented computer, a handheld computer, and also manufactures the handheld computer

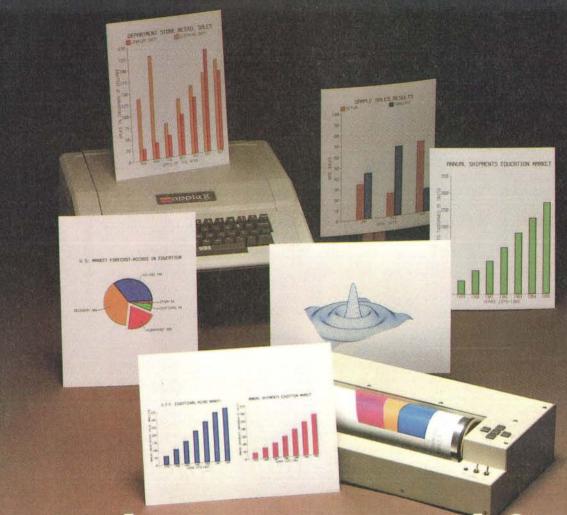
sold here under the Radio Shack name. Casio makes and sells the FX-9000P, a desktop microcomputer aimed at scientists and engineers. Matsushita is producing a 6502-based handheld computer for sale under both the Panasonic and the Quasar names. Sony offers its Typecorder and a word processor that uses 3-inch floppy-disk drives. Matsushita and Hitachi are making 3-inch floppy-disk drives too.

Japanese consumer electronics companies know what an important role convenience of use plays in the sale of consumer goods. If we're lucky, these companies will introduce microcomputers that are not just friendly to users but are downright seductive.

Of particular interest to current microcomputer users is the Suwa Seiko Group, maker of Seiko watches. Suwa Seiko established the Shinshu Seiko Company Ltd. in 1961 to make watch parts. Shinshu Seiko now makes small liquid-crystal displays and digital printers. In the U.S., we know Shinshu Seiko better under the brand name Epson, as in Epson MX-80, the matrix printer that took the U.S. by storm.

Epson has made computers since 1978, when sale of the EX-1 office computer began in Japan. In 1980, Epson introduced to the Japanese market the KX-1, a desktop computer with built-in dual-disk drives. Epson America recently showed the HX-20, a handheld computer that looks very much like the Sony Typecorder, in the United States. At the October 1981 Data Show in Tokyo, Epson exhibited a desktop personal computer, the QC-20, which runs CP/M, has a 4-MHz Z80 processor, and comes with up to 256K-bytes of RAM (randomaccess read/write memory). The Data Show also gave Epson the opportunity to introduce a slim-line, 51/4-inch floppy-disk drive called the FT-20. Look for Epson to do big things with small packages.

Sony's plans for microcomputers are unknown, but in researching this article, I talked with many executives from Japanese electronics companies in the United States. Three people told



## How to chart your company's fortune without spending one

It's a fact. A single chart or graph can tell you instantly what it takes hours to interpret from printouts or other raw data.

Now, with the Strobe 100 Graphics Plotter and Software package, you can create superb hardcopy graphics directly from your computer. And you can do it for an investment of only \$995.

The Strobe System transforms complex data into

dynamic, colorful visuals with a few simple commands from your computer. Charts and transparencies that once took hours to produce are plotted within minutes. Information can be presented as bar charts, pie charts, curves or isometrics in a variety of colors. And with a resolution of 500 points per inch, the Strobe 100 matches or surpasses the quality of plotters costing thousands of dollars more.

You can also save and modify your graphics through Strobe's menu-driven programs. A broad selection of software-including a VisiCalc\*-compatible programis now available.

When the Strobe Graphics System is interfaced to your computer, an 8-1/2 x 11 inch sheet of paper can speak anyone's language-visually. Visit your local dealer and learn

> how to start charting your fortunes today. Because a perspective on the present can also be your window on the future.



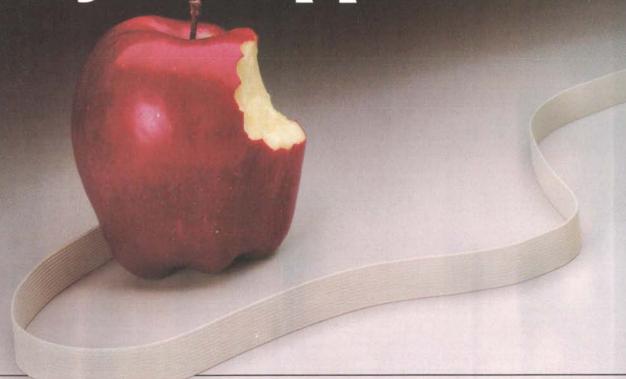
Strobe Inc.

897-5A Independence Avenue Mountain View, CA 94043 Telephone 415/969-5130

The Strobe Graphics System Seeing is believing

Circle 393 on inquiry card. "\/iciCalc ic a trademark of\/iciC

# The disk drive that puts more byte into your Apple.



## Introducing the first totally compatible Floppy Disk Drive.

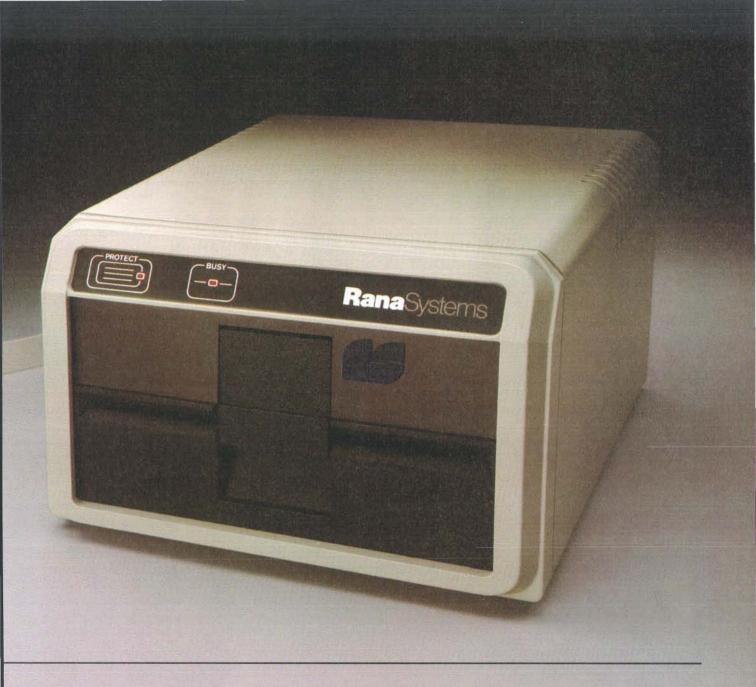
Rana Systems has designed a totally compatible disk drive for Apple, that's better than Apple's. A high density, high capacity disk drive and controller that offers a myriad of features Apple never thought of. Unique advantages that get the maximum efficiency out of your existing Apple II® hardware and software.

At Rana, we knew you wanted more storage, so we went right to the core of the problem. Even our most economical model is designed to give you 15% more storage capacity than Apple's. Our top-of-the-line unit gives

you 4 times the capacity of Apple's comparable unit. Even our design is far more dramatic than theirs. With lines that actually complement the sleek Apple II computer.

## We're a step ahead of Apple because we have a faster step.

Holding more information is even more valuable when you can get it faster. The Rana System track positioning mechanism is engineered to access three to four times faster track to track, with greater accuracy than Apple's. Our disk drive offers safeguards like a stall provision to protect spin motor burnout,



an advanced write protect feature that keeps your information where you put it, and an energy saving device that "powers down" when your disk drive is taking a break.

## We even took a bite out of Apple's price.

Our most popular model is 25% more economical per byte than Apple's, providing you with maximum performance, superior cost efficiency, and totally compatible styling. It also comes with a free diskette containing all the optional software and supports you'll need to enhance the capacity and performance. And it's all backed up with an efficient service

support system, and a full 90 day warranty.

The Rana System Floppy Disk Drive. Just plug it into your Apple and all those delicious extra bytes will be yours.

## RanaSystems...



Circle 358 on inquiry card.

20620 South Leapwood Avenue, Carson, CA 90746 213-538-2353. For dealer information call toll free: 1-800-421-2207. In California only call: 1-800-262-1221. Source Number TCT-654.

Circle 329 on Inquiry card.

Did you know that with the new

## UCSD\*

**P-SYSTEM** 

**VERSION** IV

you can write programs in



## and run them on

ALTOS, APPLE, COMMODORE, CROMEMCO, DEC, IBM, INTERTEC, PHILIPS, OHIO SCIENTIFIC, RADIO SHACK, TERAK, TEXAS INSTRUMENTS, VECTOR GRAPHIC, XEROX, ZENITH, and many more...

without change!

(Think about that next time you want a larger market)

We support systems software and/or applications ready-to-run on APPLE, DEC LSI-II‡, RADIO SHACK MODEL II§ & III§ and ALTOS.

## **PCD** SYSTEMS

P.O. Box 143 Penn Yan, NY 14527 315-536-7428

> ‡TM Digital Equipment §TM of Tandy Corp. \*TM U. of California

## Japanese Computers

me that Sony has a marvelous personal computer running. Two of these sources said that the Sony computer is based on the 8086 microprocessor. One of these sources said that Sony had not yet decided to market the computer. Another enticing report claims that Sony is developing a 3-inch Winchester hard disk.

Matsushita will soon introduce a floppy-disk drive module for its handheld computer. The module incorporates a Z80 microprocessor and runs CP/M. Last fall at the press conference introducing the handheld computer, a Panasonic spokesman said, "This is only the beginning."

## An Exceptional Entry

Among the Japanese microcomputers reviewed in this issue is the Bubcom80 from Systems Formulate Corporation. This small company, recently founded with Fujitsu's help by a former designer for Fujitsu, is neither a consumer electronics manufacturer nor a major computer manufacturer. Systems Formulate is, however, entirely devoted to designing and selling microcomputers and to teaching people how to use them. In addition to its own Bubcom80, Systems Formulate sells the Commodore VIC, the NEC PC-8001, the Apple II, and the Oki if800. A more detailed profile of Systems Formulate appears later.

## Japanese Pricing Policies

Some American advertisements are welcoming the entrance of the Japanese into the microcomputer market here. Other voices, however, are warning that the Japanese will use unconscionable pricing policies to drive their American competitors out of the market.

American semiconductor manufacturers reportedly feel that Japanese manufacturers are "dumping" integrated circuits in the United States. That is, they're selling at a loss in order to drive American companies out of the market. The Japanese maintain that they are selling at a small profit despite paying a 4.2-percent tariff.

Chris Rutkowski, marketing and

national sales manager of the peripheral products division of Epson America, offers a strong rebuttal to charges that the Japanese practice unfair pricing. Rutkowski sums up the difference between the way American and Japanese companies price their products with: "The Americans make a product and sell it for as much as they think they can get. The Japanese make a product and then figure out what it actually cost to make and distribute it. Then they add 15 percent. This is fair, equitable pricing."

American car advertisements on television are now verging on racism. While it's convenient for the American auto industry to blame the Japanese for plummeting sales, most consumers realize that Detroit is in trouble mainly because its executives were appallingly slow in realizing the need for small, efficient cars.

The American microcomputer industry seems far more progressive than the car industry. American microcomputer manufacturers expect a challenge and are preparing to meet it—I hope—without resorting to slurs. It seems reasonable to expect that fair competition between domestic companies and the Japanese in the American microcomputer market will lead to better products and lower prices, with several companies surviving on each side and the American consumer being the ultimate victor.

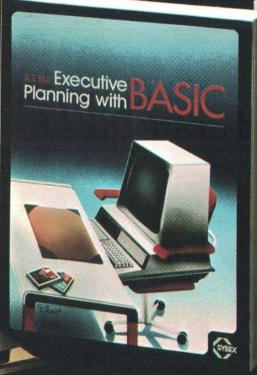
anese trading company founded in 1977 to specialize in electronic products. BMC sells video monitors and terminals, memory boards, electronic typewriters, printers, the Oki if800 microcomputer, calculators, electronic games, and other products based on integrated circuits. BMC's promotional literature mentions personal computers as well as business computers. Its American subsidiary is known as

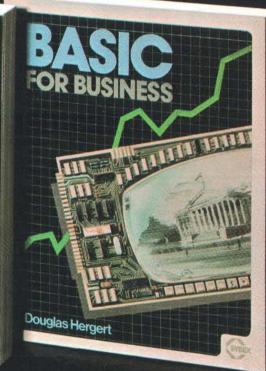
Oki Electric Industry Company Ltd. of Tokyo manufactures the if800 distributed here by BMC. Okidata Corporation,

BMC USA, Inc.

## At last, two books to show you how to make BASIC mean business.







ISIC for Business by Douglas Hergert, Ref. B390, \$12.95. This book will show you how to use a small computer to complete business tasks faster, more efficiently. It's a solid, practical introduction to BASIC, the programming language most commonly used in microcomputing.

ou'll learn to use the computer to:

- · write sales reports and financial statements
- · produce graphs and charts
- calculate depreciation and present value
- perform cost/volume/profit analysis
- plus much more!

Realistic sample programs illustrate each element of the language, and exercises at the end of each chapter encourage you to explore new ways of using BASIC on your own. A special feature is a section which introduces three other programming languages: COBOL, FORTRAN and Pascal.

**Executive Planning With BASIC, X.T. Bui,** Ref. B380, \$12.95. This fascinating book presents a collection of BASIC computer programs for the most up-to-date business decision models. It explodes the myth that programming is for computer specialists only. The executive will quickly learn how to accelerate and improve decision-making and planning methods by using a microcomputer.

Here is an overview of what's covered:

### **DECISION MODELS UNDER CERTAINTY**

- Cost-Volume-Profit: Finding the Break-Even Point
   Linear Programming: The Simplex Method Inventory
  Management: The EOQ Formula

### **DECISION MODELS UNDER UNCERTAINTY**

 Sequential Decision Model: a Decision Tree for Discounted Expected Values • Critical Path Analysis and PERT . A Simulation Model for Optimal Queuing

- FORECASTING MODELS
   Exponential Smoothing Linear Regression Multiple Linear Regression
- INVESTMENT MODELS

SYBEX has the most comprehensive library available, from introductory to business to hardware, programming and assembly language titles; all written by computer professionals. The thorough, readable approach of SYBEX books is favored by both nontechnical people and computer specialists

To order these books or get a free catalog. fill out the coupon or call TOLL-FREE 800/227-2346. (within Calif.) 415/848-8233

		2.	
	Send me: free catalog BASIC for Business \$12.95 Executive Planning with BASIC \$12.95		
8 8	Add: \$1.50/Book UPS \$\square\$ 75\$/Book 4th Class \$8.00/Book Overseas Mail		
	Charge myVISA MasterCard American Expr	ess	
	Card # Exp. date		
	Total Amount Enclosed 5		
ğ	Signature		
	NAME		
S.	ADDRESS		
8	CITYSTATEZIP		
TOTAL PROPERTY.	Mail to: SYBEX, Inc. SYBEX 2344 Sixth St., Dept. A-1		

## Japanese Computers

Oki Electronics of America, Oki Semiconductor, and Oki Electric Overseas Corporation are other subsidiaries of Oki Electric Industry. Last year marked Oki's centennial. While the company's size doesn't rival that of giants such as NEC and Toshiba, Oki does devote all the efforts of its 12,400 employees to electronic and telecommunications equipment.

About 38 percent of its sales consist of electronic business machines. Oki's OKITAC series of computers sells well in Japan, as do Oki's modems and teleprinters. Okidata printers are popular here. Oki Semiconductor's products include 64K-bit RAM chips and other VLSI (very large-scale integration) chips. The company's new VLSI plant opened in 1981 and was producing 3 million 64K-bit dynamic RAMs a month by late 1981. Oki expects production to rise gradually to 10 million a month by 1985.

Canon Although better known for calculators and cameras than for computers, Canon is capable of mounting a substantial microcomputer marketing effort in North America. Canon has diversified in recent years and now produces copiers, electronic typewriters, micrographics equipment, magnetic-card readers, magnetic heads for audio and digital devices, and microcomputer disk drives. Canon is conducting research in computeraided design (CAD) and computeraided manufacturing (CAM). In fact, 40 percent of Canon's sales in North America are business machines.

The two primary markets for microcomputers are home and office, and Canon USA has extensive experience in North America in both. So far, Canon has produced computers for the office market only. The Canon CX-1 and the BX-3 are general-purpose small-business computers.

The TX-10 and TX-15 are designed for fields such as banking and finance, payroll management, foreign exchange, science, statistics, insurance, real estate, and auto sales. The TX-10 has a numeric pad, and the TX-15 has a standard alphanumeric keyboard. The TX-25 has an alphanumeric keyboard and 4-inch floppy-disk drives. All these machines are based on the Motorola 6809 microprocessor. Canon could seek a larger market through its 7500 independent dealers in the United States and Canada, and its 700 authorized service centers could be a strong selling point for consumer computers.

## FUJITSU

Fujitsu Ltd. is Japan's largest manufacturer of computers and its

fourth-largest producer of semiconductors. Although Fujitsu's assets of \$3 billion are less than those of a few other Japanese corporations, Fujitsu devotes most of its efforts to computers and data communications. In fact, of Fujitsu's \$2,769,895,000 in 1981 sales, computers and data communications accounted for \$1,819,495,000 or 66 percent. Fujitsu makes printers, large hard-disk systems, terminals, integrated circuits, and many other computer-related products.

Fujitsu's prowess in making large computers is widely recognized. In May 1981, Fujitsu introduced the world's most powerful general-purpose computer, the FACOM M-382. Its dual processor system has 32 to 128 megabytes of main storage and as many as 64 channels, for a maximum total throughput of 96 megabytes per second.

Fujitsu is one of the world's largest producers of integrated circuits; its 64K-bit dynamic RAM mass-production system is the world's largest. Fujitsu sells integrated circuits in the United States through the subsidiary Fujitsu Microelectronics. In development are high-electron-mobility transistors (HEMT) and Josephsonjunction elements, both of which should bring dramatic improvements in circuit performance.

No one is doing more with bubble memories than Fujitsu. Mass production of 64K-bit and 256K-bit bubble ISE is an
International
Consortium
of the World's
Leading Software
and
Consulting Firms,
Representing
Over 5,000
Professionals
Around the World

Major companies around the world are joining this consortium to provide mainframe-quality software for microcomputers.

ISE provides professional application developers with the finest array of integrated software tools available anywhere:

- Data Base Management
- Data Communications
- Programming Languages
- Screen Management

Also available—a full spectrum of the most advanced office systems for an integrated approach to office management and control.

These fine products are distributed in most countries through ISE. For more information, contact:

In U.S.: ISE-USA P.O. Box 248 Lafayette, Indiana 47902 Tel: (317) 463-2581

In Germany: ISE-ADV/ORGA GERMANY Lipowskystr. 26 8000 Munich 70 Tel: (0 89) 77 60 23-4

In France: ISE-CEGOS Tour Chenonceaux 204, Rond-Point du Pont de Sèvres 92516 Boulogne Billancourt Cedex Tel: 620-61-04

In Switzerland and Austria: ISE-ADV/ORGA SWITZERLAND Mainaustraβe 17 CH-8008 Zürich Tel: (01) 32 02 70-1

Elsewhere: ISE-INTERNATIONAL P.O. Box 248 Lafayette, Indiana 47902 Tel: (317) 463-2581



P.O. Box 248 Lafayette, IN 47902

For more on one of our fine products, see page 303

## As inevitable as evolution.

Two rapidly changing technologies:

- **1.** Computers shrinking in size and price, growing in power.
- Professional software, steadily increasing in sophistication.

It was inevitable that someone would bring these technologies together. That someone is ISE: a new kind of computing company created to bridge the evolutionary gap between professionalquality software and microcomputers.

The result of an international alliance of software and computer consulting companies, ISE today produces the world's most sophisticated software for the world's smallest professional

computer systems.

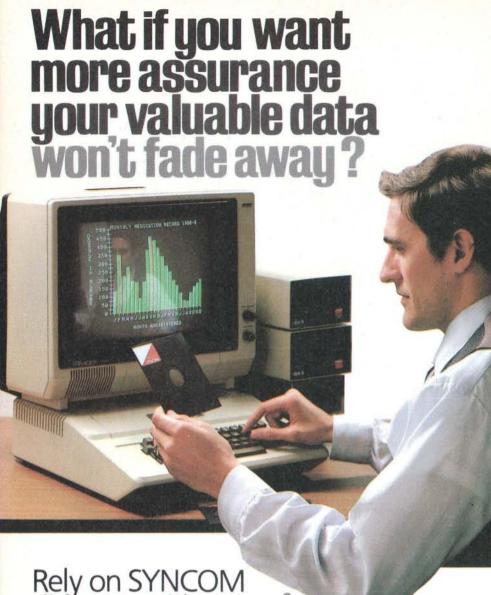
ISE's current offerings of data base management systems and application development tools provide all the capability of mainframe software, at a fraction of the price.

For more information on this major development in business computer technology, phone our main office at (317) 463-2581 or contact the ISE affiliate nearest you.



Mainframe-quality software at micro prices.

P.O. Box 248 Lafavette, IN 47902



Rely on SYNCOM diskettes with Ectype<sup>®</sup> coating. Balanced coercivity means long-lasting signal life.

Syncom diskettes assure excellent archival performance in the following ways.

First, with calibrated coercivity - a precisely balanced blend of milled ferrous oxides that allows Ectype® coating to respond fully to "write" signals, for strong, permanent data retention.

Then, a burnished coating surface to boost both signal strength and packing density.

Carbon additives drain away static charge before it can alter data.

And, finally, every Syncom diskette is write/read-back certified to be 100% error free.

To see which Syncom diskette will replace the one you're using now, send for our free "Flexi-Finder" selection guide – and the name of the supplier nearest you.



Balanced coercivity of Ectype® coating allows write current to saturate fully and permanently.

Syncom, Box 130, Mitchell, SD 57301. 800-843-9862; 605-996-8200.

## NCON

Manufacturer of a full line of flexible media

"See us at NCC Booth #5510"

## Japanese Computers\_

memories will begin soon, and Fujitsu has developed a prototype 1-megabit bubble memory. Although Fujitsu foresees the use of bubble memories in personal computers, price seems an obstacle at present.

In the U.S., Fujitsu markets its small- and medium-scale computers via the TRW-Fujitsu Company, a joint venture with TRW Inc. Fujitsu exports its large-scale computers to Amdahl Corporation, which markets them in an OEM arrangement.

In the realm of microcomputers for the mass market, Fujitsu has yet to establish itself. Fujitsu's "piggy-back" microcomputers, with their detachable ROMs (read-only memories) are certainly innovative. Users find the ease of replacing these ROMs a great aid in program development. The Fujitsu Micro 8 (FM-8), with twin 6809s and an optional Z80, is impressive too, although we have lately learned that it will not be sold in the U.S. in its present form. Fujitsu is among the Japanese firms rumored to have 8086-based systems in development, but they're not expected to be unveiled this year.

**© HITACHI** Hitachi is a 70year-old corporation whose 151,000 employees turn out thermal, hydroelectric, and nuclear power equipment as well as other electric utility equipment; chemicals; iron, steel, wire, and cable; industrial machinery; consumer products including televisions, video-tape recorders, audio equipment, and air conditioners; and computers, semiconductors, and other electronic equipment. Consumer items accounted for 21.3 percent of 1980 sales; computers, semiconductors, and other electronic equipment accounted for 18.9 percent. Hitachi's Maxell floppy disks have a substantial share of the market here and a reputation for excellent quality. Hitachi's dynamic RAMs also enjoy a good reputation, including the 64K-bit chips. In 1981, Hitachi was Japan's second-largest producer of semiconductors, turning out \$614 million worth of chips.

## THE \$595\* SMART TERMINAL

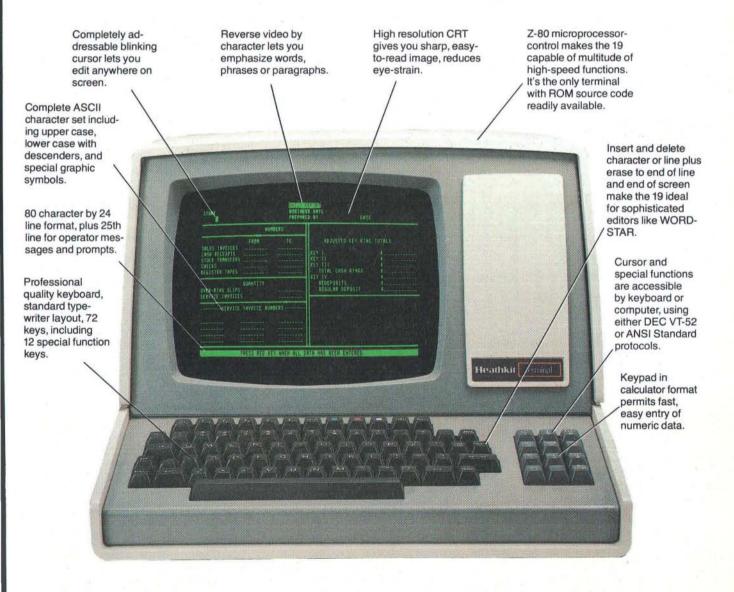
The Heath 19 Smart Video Terminal gives you all the important professional features you want in a terminal, all for under \$600.\* You get the flexibility you need for high-speed data entry, editing, inquiry and transaction processing. It's designed to be the backbone of your system with heavy-duty features that withstand the rigors of daily use.

Standard RS-232C interfacing makes the 19 compatible with DEC VT-52 and most computer systems. And with the 19, you get the friendly advice and expert service that makes Heath/Zenith a strong partner for you.

Sold through Heathkit Electronic Centers† nationwide (see your white pages for locations). Stop in today for a demonstration of the Heath 19 Smart Video Terminal. If you can't get to a store, send for the latest Heathkit® Catalog. Write Heath Co., Dept. 334-894. Benton Harbor, MI 49022.

## HEATH/ZENITH

## Your strong partner



<sup>\*</sup>In kit form, F.O.B. Benton Harbor, MI. Also available the completely assembled Zenith Z-19 at \$895. Prices and specifications are subject to change without notice.

<sup>†</sup>Heath Company and Veritechnology Electronics Corporation are wholly-owned subsidiaries of Zenith Radio Corporation. The Heathkit Electronic Centers are operated by Veritechnology Electronics Corporation.

## IBM personal computer UCSD p-System™IV-1

A superior implementation of the UCSD p-SYSTEM is available NOW for your IBM Personal Computer.

Network Consulting has added many features which the professional programmer will find useful. These features are not available from any other sources.

 Hard disk support for Corvus, Tall Grass Technology and others

 25% more floppy storage, without adding or modifying hardware, retaining compatibility with standard IBM diskettes

 Double sided/double tracking/fast stepping floppy disk drive support

RAM disk support (uses up to 512k RAM)
 Adaptable system support for adding custom I/O drivers

•Remote Terminal support

XON/XOFF flow control for serial printers

Disk write verification

•and more!

## Standard p-System features include:

Program chaining

Standard I/O redirection (including command files)

Dynamic program overlays

 Support for asynchronous processes and concurrency primitives in Pascal

 Fast Pascal, Fortran and Basic compilers, all producing universal p-code programs

 A powerful screen oriented editor that runs in both programming and text editing modes

 A Native machine Code Generator that processes your Pascal, Fortran and Basic programs to convert parts of them to Native machine code

 Dynamic runtime binding of separately compile programs and units.

 Turtlegraphics for easy graphics displays

Print spooler for background printing

Symbolic debugger

Extended memory support

A library of program modules and other utilities

48 HOUR DELIVERY - CALL NOW!

## UCSD p—SYSTEM from Network Consulting

The only serious choice for business

Dealer Inquiries Welcome

TM The Regents of the University of California





Network Consulting Inc. A106 - 1093 W. Broadway Vancouver, B.C. Canada V6H 1E2 (604) 738-3500

## Japanese Computers.

Hitachi's integrated circuits and computers have been selling well where marketed under Hitachi's own name. Domestic Japanese sales of Hitachi's M and L series computers have been brisk. Hitachi's M-280H is among the world's most powerful computers, with 32 megabytes of main memory. What better place to dump that much data than the Hitachi disk storage unit that holds 2.5 gigabytes? The HITAC E-800 is a formidable super minicomputer, and the HITAC L series is designed for use as terminals in distributed processing. At the smaller end of the size scale. Hitachi offers three microcomputers based on the 6809 processor; the MB-6890, reviewed in this issue, is the most powerful of the three.

Despite its size, technical excellence, and vertical integration, Hitachi has suffered some setbacks in foreign markets. Hitachi was supplying processors to Itel in the United States, and Itel's debacle in computers hurt Hitachi here. In response, Hitachi has signed an agreement to supply large processors to a National Semiconductor Corporation subsidiary, National Advanced Systems Corporation. Hitachi has a similar arrangement in Europe with Olivetti.

The FCC's radio-frequency interference rules postponed the Hitachi 6809-based machines' entry into the American market. Hitachi is showing signs of being unhappy about software support for its 6809-based systems and is considering basing its future microcomputers on the 8086. Whatever Hitachi's decision, this giant company can make anything it wants to make, and it is sure to make interesting microcomputers.

NEC

Nippon Electric Company is another of the Jap-

anese corporate giants on the international scene. With 64,000 employees and \$5,174,493,000 in assets in 1981, NEC produces consumer products, including color televisions, hi-fi audio equipment, and kitchen appliances; microcomputers such as the PC-8000

series; and minicomputers such as the Astra series. It also produces mainframes, including the NEC System 1000, which can execute 29 million instructions per second, has a 64-megabyte main memory, a 256K-byte high-speed cache memory, and excellent integrated circuits, including NEC's widely used 64K-bit dynamic RAMs and 512K-bit ROMs are in the experimental stage).

NEC's long list of peripherals is headed by the excellent Spinwriter series of letter-quality printers, renowned RGB (red-green-blue) color monitors, matrix printers, band printers, modems, floppy disks, and Winchester hard disks. In 1981, NEC led the world in production of semiconductors with sales of \$805 million, about seven times those of Texas Instruments.

NEC clearly has everything needed for vertically integrated production of microcomputer systems. Moreover, much of its strength is in computers (24 percent), electronic devices (23 percent), and home electronics (13 percent).

Two of NEC's subsidiaries are now selling the PC-8000 series in the U.S. NEC Home Electronics USA, Personal Computer Division, targets the personal-computer market, while NEC Information Systems Inc. sells to the small-business market. NEC Information Systems also offers office furniture designed for the PC-8000 and a new communications board for the PC-8000 in the office environment. Since its inception in 1977, NEC Information Systems has grown to an annual revenue rate of \$100 million.

Indications are that both NEC Home Electronics and NEC Information Systems plan aggressive expansion. NEC exhibited two new 8-bit microcomputers in Japan last year. Reports suggest that NEC Home Electronics will bring out a computer (perhaps the PC-6000) to compete head-on in price with the Commodore VIC.

NEC Information Systems may introduce the PC-8800, which will represent an improvement in mass storage

## FMS-80. THE TWO DOOR DATA BASE PLUS



Door #1: Reports you'll use *today*. Door #2: The sky is the limit.

We've split the proven, bestselling FMS-80 micro data base manager into two parts. And we've split the price.

Part one (FMS-81) gives you the essential file and reporting features. You can quickly create programs with input questions a clerk can understand, and with reports a manager can *use*.

And FMS-81 with its new manual, is so easy to use, you'll be generating reports the first day. FMS-81 sells for \$495.

Part two (FMS-82) has all the fancy stuff. Including an Extended File Maintenance language that lets you perform virtually unlimited manipulation on up to 19 different data files simultaneously.

Using FMS-82, you or your computer dealer can make FMS-80 do *just about anything*. FMS-82 sells for \$495.

Naturally, FMS-82 is fully compatible with all the files and functions you generate with FMS-81.

FMS-81 is so useful, it might seem like you'll never need FMS-82.

But as you expand your use of computers, isn't it nice to know it's there?

The FMS family runs under CP/M, MP/M, CDOS, and Turbodos. Call or write today for a brochure detailing the extensive capabilities of the Two Door Data Base Manager, and the name of your nearest dealer.

You'll be impressed.

## Systems Plus, Inc.



1120 San Antonio Road Palo Alto, CA 94303 (415) 969-7047

DJR Associates, Inc. 2 Highland Lane North Tarrytown,

NY 10591

FMS-80, FMS-81, FMS-82 TM DJR Associates CP/M, MP/M TM Digital Research CDOS TM Cromemco Turbodos TM Software 2000, Inc.

Circle 403 on inquiry card.

Circle 19 on inquiry card.



118 S. MILL ST. PRYOR, OK. 74361

ALL PRICES ARE CASH DISCOUNTED 3%. C.O.D. AND CHARGE ORDERS ARE 3% MORE. DEALER INQUIRIES INVITED.

## DON'T PAY MORE !!!

### TRS-80 MODEL III



## TRS-80 DISK DRIVES

48K 1-DRIVE.....\$1499 48K 2-DRIVE.....\$1749

MODELI		
TEACor	TANDON	

MODELIII
DRIVE 0\$595
DRIVE 1\$239
DRIVE 2, 3\$250

COLOR COMPUTER	
DRIVE 0	\$499
DRIVE 1 2 3	\$250

### EPSON PRINTERS

ALMOST EVERYONE WHO CALLS ABOUT EPSON PRICES BUYS A PRINTER. THERE ARE TWO REASONS FOR THIS: 1. WE USUALLY HAVE THE LOWEST PRICE IN THE COUNTRY. 2. WE ALMOST ALWAYS HAVE THE PRINTER THEY NEED IN STOCK. SO...CALL US TODAY!

## **AW...WHAT THE HECK**

RAM Memory Chips for the TRS-80 Apple

If is the policy of American Business Computers to offer merchandise at the lowest price, posters as the policy of the policy of

\$16.95

PER 16K "a116 s" These 200 nanosecond chips are fully compatible with all TRS-80 products instructions for insertion are included. Towever, the dip shunts required for converting a 4K Model i is a 16K Model i are not included all this low price.

SET

COLOR COMPUTERS	
4K LEVEL I	\$318
16K LEVEL I	\$335
16K EXT. BASIC	\$435
32K EXT. BASIC	\$520
MODEL II	\$3287
MODEL 16 1-DRIVE	\$4495
MODEL 16 2-DRIVE	\$5218
OKIDATA MICROLINE 80	\$399
82A	\$469
83A	\$719
84	\$1250
C. ITOH F10-40	\$1450
C. ITOH F10-55	\$1750
C. ITOH PROWRITER	\$499

918-825-4844

## Japanese Computers

and packaging over the the PC-8000. The 8800 is expected to have 8-inch drives, and, unlike the PC-8000, the whole system can be turned on and off with a single switch. Both NEC Home Electronics and NEC Information Systems are offering more applications software tailored to the PC-8000.

Rumors are also circulating that NEC will introduce a 16-bit microcomputer based on Intel's 8086 microprocessor, but it's unclear whether the machine's target is home, office, or both. If and when NEC does introduce the 8086-based machine, much will be determined by which subsidiary introduces it—NEC Home Electronics, NEC Information Systems, or both.



Akio Watanabe founded Systems Formulate in September 1978. Since 1964,

Watanabe's true love has been small computers. While a hardware designer at Fujitsu, he designed the FACOM 230 and FACOM V series systems. Watanabe struck out on his own in 1978 in order to spread the benefits of microcomputers to the public. Systems Formulate not only designs and sells machines but also provides training courses.

Sales from April 1980 to March 1981 were \$4,300,000, up from \$3,100,000 the previous year. Systems Formulate has already made a full return on its original investment of \$230,000. Fujitsu president Taiyu Kobayashi helped Systems Formulate with technology and personnel as well as financing.

Perhaps the most striking fact about Systems Formulate is that it sells 8 to 10 percent of all the personal computers in Japan. Systems Formulate has four retail stores, three in Japan and one in Palo Alto, California. The systems sold include the Commodore VIC, the Apple, the NEC PC-8001, and the Oki if800.

Systems Formulate has two training "campuses," both in Japan. The campuses, which offer a variety of software training courses, provide a separate personal computer for each student. The most popular course? "SB nyu-mon," the beginner's course in small-business computer applications. Students can rent computer time for study outside class hours.

Watanabe and other Systems Formulate staff members designed the Z80-based Bubcom80, which Fuiitsu builds. The Bubcom80 is a beautiful machine, and a drop in the price of bubble memory would make it hard to resist. Systems Formulate's direct retail sales of computers may enable the company's talented designers to understand better than others the needs of personal computer users. Add to that the little company's close ties with Fujitsu and apparent ability to use the giant's production facilities, and Systems Formulate seems an attractive dark horse in the American microcomputer market. At this point, however, Systems Formulate's only machine is too expensive for all but a few personal computer users.

pany that employs almost 64,000 people, Toshiba offers products that range from light bulbs to a neutral-beam injector for fusion experiments. Perhaps most impressive about Toshiba as a contender in the U.S. personal computer market is that Toshiba combines experience in both consumer electronics and information-processing systems with the capacity for vertical

integration. Toshiba is Japan's third-

largest producer of semiconductors,

with sales of \$541 million in 1981.

TOSHIBA

A century-old,

\$9-billion com-

Toshiba's technological feats include a pocket liquid-crystal-display television, a voice-driven word processor for the intricate Japanese language, a highly successful family of CMOS integrated circuits, and the world's first microcomputer that uses silicon-on-sapphire (SOS) technology.

The first two microcomputers Toshiba introduced in the United States were its T200 and T250 desktop machines. Both use the 8085A microprocessor and come with CP/M, CBASIC II, and Microsoft BASIC

PACKET MAN FOR

## G&G ENGINEERING is working wonders with CompuPro!

You can get FAST single and multi-user CompuPro based configurations fully integrated from G&G ENGINEERING.



MULTI-USER SYSTEMS

## MP/M™8-16

Are you having trouble deciding whether to go 8 bits (with lots of software that runs NOW), or 16 bits (with all that potential power)? Thanks to G&G, it's a split decision—EVERY-BODY WINS! G&G ENGINEERING's implementation of MP/M 86™ does it all! We call our package MP/M 8-16 because it uses Digital Research's MP/M 86 to provide a multi-user, multi-tasking environment for running both CP/M 2.2™ and CP/M 86™ compatible programs . . . AT THE SAME TIME!

That's right! Imagine a system where one user could be running Wordstar™, another dBASE II™, a third SUPERCALC™ (all 8 bit CP/M 2.2 compatible programs), while a fourth user runs CBASIC 86™ (16 bits and CP/M 86 compatible)! It's all made possible thanks to CompuPro's powerful hardware, including the 8085/8088 processor board and DMA

disk controllers, and thanks to G&G Engineering's software expertise.

Plus you can install up to a Megabyte of CompuPro high speed static RAM memory and an assortment of hard disk drives. This system means business.

But flexibility isn't the only good news. This system is also *FAST* (naturally, it's by G&G). What's more, it's *BIG.* CP/M 2.2 compatible programs when run under **MP/M 8-16** are not limited to user work areas of 48K, as with 8-bit-only MP/M systems. With MP/M 8-16, your work area for 8 bit software is a whopping 62K!

\*MP/M 8-16 is a proprietary implementation of MP/M 86 version 2.0. This implementation takes advantage of the CompuPro 8085/8088 processor card and can not be run on other CPU cards.

## **UNIX®**

DUAL SYSTEMS and CompuPro make a perfect match in the best micro-computer version of UNIX we've seen. This is not "UNIX-LIKE"—this IS UNIX, implemented on the MC68000 processor (32 bit internal registers!). For the software connoisseur.

APPLICATIONS (for users of our CompuPro systems)

## SUPERSHEET

Now you can really spread out with **SuperSheet**, G&G's enhancement of Sorcim's SUPERCALC™. Upward compatible with all your existing SUPERCALC files, **SuperSheet** allows up to **15** times more storage! If you are among the many who have been frustrated by the Memory FULL message, **SuperSheet** is the answer to your prayers! This is the largest electronic spreadsheet program on the market. Once again, G&G has taken the best and made it even better. (Requires a minimum of 128K RAM)

## WARP DRIVE

Compute in the fast lane with WARP DRIVE, G&G's RAM memory disk drive. WARP DRIVE is extended address RAM memory configured with CP/M 2.2 to look like a disk drive. Your programs can run from 10 to 30 times faster! When running CP/M 86, WARP DRIVE automatically becomes directly addressable main memory. WARP DRIVE is available in sizes ranging from 128K to 1 Megabyte.

## CPM-IBM

Turn your G&G system into an IBM-ulator! Your system can become a powerful software development tool for the IBM Personal Computer. (We use CompuPro's Dual Processor 8085/88—the same hardware IBM used for their own development!) Our CPM-IBM program allows you to transfer CP/M® compatible files to and from 51/4-inch diskettes in the IBM DOS format. The program discerns what kind of file or diskette it is reading, then does the appropriate conversion—IBM to CP/M or CP/M to IBM. G&G makes it easy!

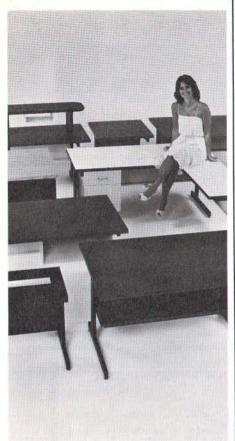
## G&G ENGINEERING

1922 Republic Avenue, San Leandro, CA 94577 (415) 895-0798

G&G Engineering is an authorized CompuPro Systems Center. We specialize in CP/M S-100 Software and Hardware integration. Our engineers are factory-trained experts in CompuPro products. All our CompuPro equipment is covered by a 2-year phone exchange warranty. Single-user systems start at \$5,000 and multi-user systems begin at \$9,000.

\*COMPUPRO is a trademark of Godbout Electronic; MP/M, MP/M 86, CP/M, CP/M 2.2 and CP/M 86 are trademarks of Digital Research; WORDSTAR is a trademark of MicroPro; dBASE II is a trademark of Ashton-Tate; SUPERCALC and SUPERSHEET are trademarks of Sorcim; CBASIC 86 is a trademark of Compiler Systems Inc.; UNIX is a trademark of Bell Laboratories; WARP DRIVE is a trademark of G&G Engineering.

Circle 459 on inquiry card.



## SITTING PRETTY

You can use just about any desk for a computer terminal stand. But with CF&A, you're sitting pretty. Our full range of desks, workstations, and terminal stands are designed to accommodate a variety of computer equipment. Choose from our Classic Series desks, DR Series desks and enclosures, specialty items like our Apple II desk, or a universal printer stand. You'll be sitting pretty with attractive color selections, durable construction, versatile configurations, useful options, competitive prices, quick delivery, and personal service. It's our way of doing business.



Computer Furniture and Accessories, Inc. 1441 West 132nd Street Gardena, CA 90249 (213) 327-7710

## Japanese Computers,

standard. The T200 has two 51/4-inch built-in disk drives, and the T250 has two 8-inch built-in disk drives.

At January's Consumer Electronics Show in Las Vegas, Toshiba surprised everyone by showing a third microcomputer, this one using a Z80A processor. Called the T100, this model has BASIC in a 32K-byte ROM, 64K bytes of user RAM, 16K bytes of video RAM, and the capacity to accept two additional 8- to 32K-byte ROM or RAM packs containing languages or applications programs. The T100's price starts at less than \$1000 and demonstrates the seriousness of Toshiba's interest in the American personal computer market. The T100 may or may not be the same machine as the rumored Toshiba PASOPIA. The PASOPIA was supposedly based on the 6502 processor and was to be priced below the Apple.

Toshiba will introduce another microcomputer at the June National Computer Conference in Houston. The T300 uses the more powerful 8088 microprocessor and is aimed at the small-business market. A single-user system with dual 8-inch, slim-line disk drives may sell for as little as \$3500, with a 10-megabyte Winchester hard-disk drive costing perhaps \$4000. A multiuser system consisting of four T300s, a Winchester drive, and a printer may sell for around \$25,000.

All of a sudden, Toshiba has covered the entire spectrum of the American microcomputer market. Its products range from home computers for under \$1000 to multiuser systems for \$25,000. The T100, T200, T250, and T300 together seem to reflect excellent long-range planning. According to Toshiba, all four machines will run the same software. There may also be a 6502-based PASOPIA in the works.

Toshiba has signed 30 dealers and has a goal of signing 40 more this year. It has also opened two retail computer stores, one in the Westwood section of Los Angeles and the other in Costa Mesa, California. Vice-president and general manager John Rehfeld of Toshiba America stresses that the

retail stores will serve as "learning laboratories for gathering information which can be useful to our dealer network."

## Speculations and a Pipe Dream

At the moment, it looks as if NEC and Toshiba are leading the pack in marketing Japanese microcomputers in the United States. Expect them to maintain their lead for some time. Both companies will soon be offering complete lines of microcomputers ranging widely in price. Both seem determined to win a significant share of the American market. Both have the resources for large-scale, vertically integrated manufacturing. Toshiba has marketed more consumer products here, but NEC has established dealer networks for its Spinwriters and video monitors and, to some extent, for its PC-8000 series.

Later this year or early in 1983, Hitachi can be expected to introduce in the U.S. a series of powerful microcomputers. Despite its setbacks in marketing computers here, Hitachi is such an impressive company that its products are likely to be worth the wait. Hitachi has successfully marketed consumer products in the U.S. and has everything necessary for vertically integrated production. The only questions are whether Hitachi will decide to build the right machines and whether the market will still be waiting by the time the Hitachi machines arrive.

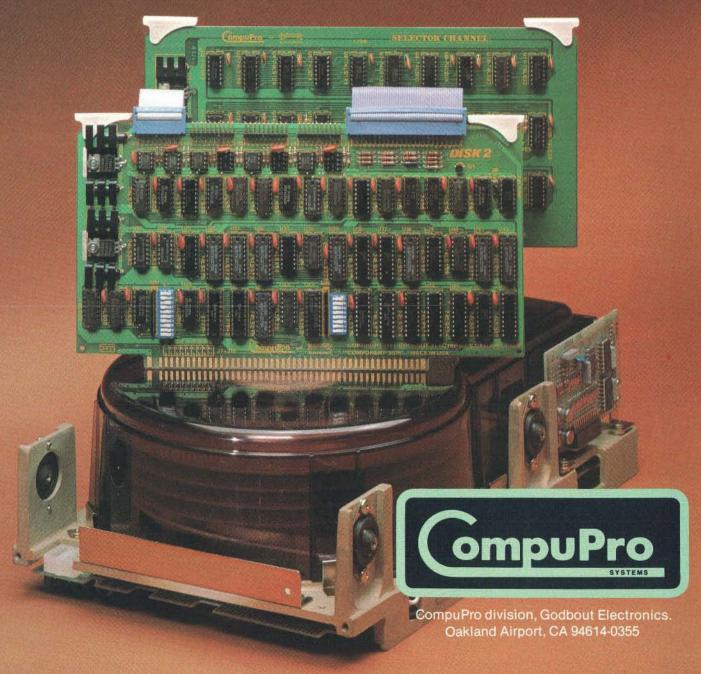
As for the consumer electronics companies, Seiko's Epson subsidiary will probably be the first to make a strong showing. Existing marketing channels and consumer enthusiasm for the MX-80, along with Seiko's state-of-the-art CMOS technology, enormous financial resources, and experience in manufacturing microcomputers, give Epson an excellent chance of winning a significant share of the American market. This is certain if Epson decides to sell its computers, as it does its printers, for very low prices.

Expect Sony and Matsushita to burst on the scene sometime during 1982 with compact, convenient home

## Performance, quality, reliability.

Disk 2 Selector Channel

Excellence in DMA hard disk control.



For business, scientific, and industrial computing solutions, contact your authorized CompuPro Systems Center.

## Performance, Quality, Reliability.

## Disk controllers *l* sub-system

**Disk 1.** High performance, DMA floppy disk controller for single or double-density, single or double-sided diskettes. IBM (soft-sector) compatible. \$495, \$595 CSC. CP/M® 2.2 \$175, CP/M-86 \$300.

**Disk 2.** High performance, DMA hard disk controller handles up to four disk drives, up to sixteen heads per drive. Compatible with MP/M, OASIS, CP/M-80, and CP/M-86. Contact factory for pricing.

Floppy Disk Sub-System. Two Qume doublesided, double-density drives provide up to 2.4M bytes of on-line mass storage. With all-metal enclosure, Disk 1 DMA floppy disk controller, CP/M-80, and CP/M-86, \$3295.

## MP/M 8-16 Operating System.

CompuPro's proprietary version of Digital Research's multi-user MP/M-86 (V2.0) gives you the best of both worlds: Run 8 bit (CP/M 2.2) and 16 bit (CP/M-86) software - simultaneously - in a multi-user environment. \$990.

## **Interfacers**

**Interfacer 1.** Two RS-232C serial ports, full handshake, independently selectable Baud rates. \$249, \$324 CSC.

Interfacer 2. Three full duplex parallel ports plus one full-feature RS-232C serial port. \$249, \$324 CSC.

**Interfacer 3-5.** Five RS-232C serial ports (2 sync/async, 3 async) with full handshake and selectable Baud rates. \$599, \$699 CSC.

**Interfacer 3-8.** Eight RS-232C serial ports (2 sync/async, 6 async) with full handshake and selectable Baud rates. \$699, \$849 CSC.

Coming soon: Interfacer 4. The latest addition to the interfacer series. Three RS-232C serial ports, one parallel port, and one Centronics parallel port.

## Memory

Static operation gives flawless DMA while handling 10 MHz clock speeds.

**RAM 20.** Extended addressing or bank select. RAM 20-8K: \$210, \$280 CSC. RAM 20-16K: \$285, \$355 CSC. RAM 20-24K: \$355, \$425 CSC. RAM 20-32K: \$425, \$495 CSC.

**RAM 16.** Works automatically with 8 or 16 bit systems (64K X 8 or 32K X 16). \$650, \$750 CSC.

RAM 17. Ultra low power (1.6 Watts typical for 64K). RAM 17-64K: \$599, \$699 CSC. 48K version also available.

**RAM 21.** Low power, high density. Works automatically with 8 or 16 bit systems (128K X 8 or 64K by 16). \$1695, \$1895 CSC.

M-DRIVE. The first "solid state disk drive" increases operating speeds up to 3500%. Memory saves are virtually instantaneous, spread sheets recalculate faster, long compiles take milliseconds instead of minutes, and disk wear is minimized too. You haven't experienced computing in the fast lane—until you've experienced M-DRIVE. 128K M-DRIVE \$1198, 256K M-DRIVE \$2395 (prices based on RAM 17; also available for other RAM types).

## **CPUs**

**CPU 8085/88.** Executes today's 8 bit and tomorrow's 16 bit software on an 8 bit bus. Chosen by leading software houses for IBM PC software development. **\$425, \$525 CSC.** 

**CPU Z.** The preferred Z80 board for high speed processing, \$295, \$395 CSC.

CPU 8086/87. High-performance 16 bit CPU includes sockets for 8087 math co-processor and 80130 interval timer/interrupt controller. Compatible with 8 bit and 16 bit memory, or any mix thereof. \$695, \$850 CSC.

## Coming soon: 8 bit Slave Processor.

Designed to complement 16 bit CPUs (such as CPU 8086/87 and our upcoming 68K board), and 16/32 bit CPUs, by running existing libraries of 8 bit software.

CompuPro delivers results in the toughest business, industrial, and scientific computing environments. Backed by a one year limited warranty (two years for boards qualified under the Certified System Component high-reliability program), CompuPro system components are the leading choice of systems integrators world-wide.

When you depend on your computer, choose a computer on which you can depend: IEEE 696/S-100 from CompuPro.

## High-performance motherboards

6 Slots. \$140, \$190 CSC. 12 Slots. \$175, \$240 CSC. 20 Slots. \$265, \$340 CSC.

## **Documentation.**

"CompuPro Product User Manuals: 1975 - 1980". This 250 + page book includes data on all older Godbout/CompuPro products, as well as many newer products such as the Spectrum Color Graphics board, Interfacers 1 and 2, CPU 8085/88, motherboards, CPU Z, and more. Softcover, \$20.

"CompuPro Product User Manuals, Volume 2". 300 + page book includes data on System Support 1, Disk 1, RAM 17, Interfacer 3, System Enclosure, and STD products. Softcover. \$25.

"Interfacing to S-100/IEEE 696
Microcomputers". By Mark Garetz and Sol
Libes; published by McGraw-Hill. Covers operating
requirements and characteristics of the S-100 bus
with clarity and precision. Softcover, \$15.

**Individual user manuals.** Interfacer 3, \$10; Disk Controller, \$25; System Support 1, \$20; most others, \$5.

## Other computer products

MPX 1-4 (4K on-board RAM) \$495, \$595 CSC.

MPX 1-16 (16K on-board RAM) \$649, \$749 CSC.

Front end processor ideal for use with multi-user systems.

Enclosure 2. Rugged, all-metal construction. Includes 20 slot motherboard, heavy-duty power supply with constant voltage transformer and line filter, cutouts for all popular connectors, positive pressurized fan with dust filter, attractive styling. Desktop model \$825, rack mount \$895.

**System Support 1.** Battery clock/calendar; sockets for battery backup RAM, 9511 or 9512 math processor, and 2716 ROM options; RS-232C serial port; triple interval timers; dual interrupt controllers; power fail interrupt; more. \$395, \$495 CSC (add \$195 to all prices for optional math processor).

**Selector Channel.** High speed DMA controller. Contact factory for pricing.

Mullen Extender Board. Simplifies servicing, troubleshooting, and testing. \$89.00

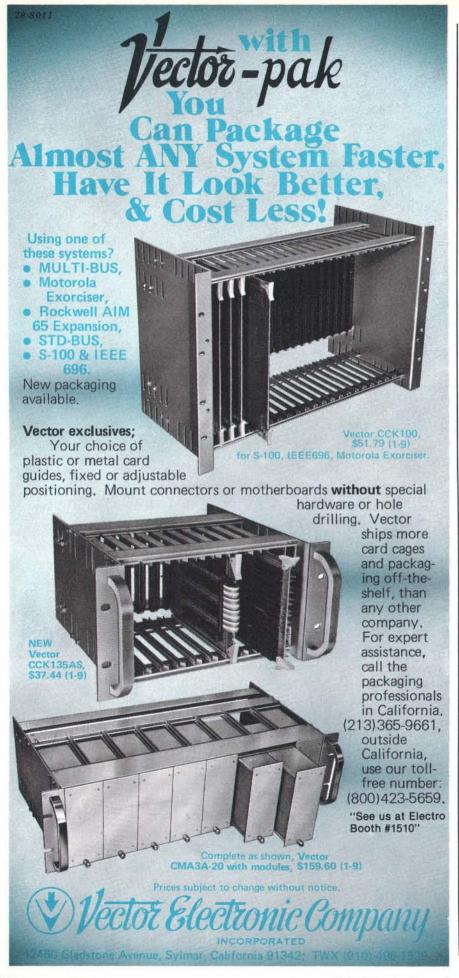
Mullen Controller Board. 8 opto-isolators accept outside world input data; drives 8 reed relays for computer interface to external devices (power relays, lights, etc.). \$219.00

CP/M, CP/M-86, and MP/M are trademarks of Digital Research; OASIS is a trademark of Phase 1.



CompuPro division, Godbout Electronics, Oakland Airport, CA 94614-0355

n business, industrial, and scientific computing. the Systems Center nearest you.



## Japanese Computers\_

computers that will set new standards for ease of use. The marketing channels open to these two companies are so extensive that both can easily recover from a late start.

The challenge to these companies is to design and produce the right machine on the first try. If the machines sacrifice versatility and performance to achieve the kind of compactness that fits neatly on one corner of a coffee table, then Sony and Matsushita will have to work very hard to succeed on the second try. If these two companies come in with machines that are not only compact and convenient but also are as powerful as the IBM Personal Computer, look out!

Any of the companies described in this article, as well as their American competitors, could get a lead on the others by bringing to market a system with clearly superior performance for the price. One obvious strategy would be to sell a standard built-in micro-Winchester hard disk for about the price of two standard floppy-disk drives. Veteran microcomputer users know how much faster the hard disks make many operations, and novices could tell at a glance when shopping for a system. Japanese and American computer companies with experience in manufacturing hard disks could turn that experience to advantage by mass producing micro-Winchesters and selling them at mass-market prices.

Here's where speculation ends and a pipe dream begins (no reference to Unix intended). Imagine an 8086based system with 256K-bytes of RAM, a CP/M-86 or MS-DOS operating system, BASIC in ROM, and a keyboard of high quality and versatility. That sounds a lot like a fully equipped IBM Personal Computer. Add a built-in micro-Winchester drive, a fold-away flat-screen video display, a built-in LSI 1200-bit-persecond modem, a home-appliance controller, and sell the whole thing for \$3500 or less. Offer a high-quality RGB color monitor for \$500. Then IBM, Radio Shack, and Apple would have something to worry about.

# INCREASE SALES OF CP/M®

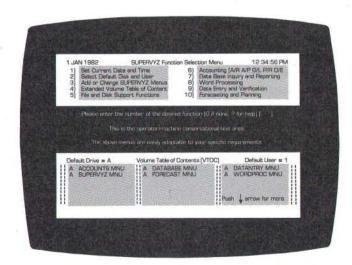
## ANYONE CAN USE CP/M WITH SUPERVYZ

SUPERVYZ is a revolutionary software concept that serves as a mediator between the user and CP/M, requesting information in plain English and translating the response into the form CP/M recognizes. Users are led from one application to another in a courteous and step-bystep sequence of menus. Aided by descriptive error messages and computer-assisted tutoring, the operator avoids mistakes and is advised of the next step in a polite and friendly manner.

## EXPAND YOUR MARKET AND LOWER COSTS

As a Dealer, SUPERVYZ allows you to sell CP/M computers and application software to non-technical markets, without the added expense of teaching the operating system. EPIC supplies the menus or you create your own to meet the exact needs of your customers. Because SUPERVYZ is compatible with over 2,000 programs and 300 computers, you can bundle software from different suppliers and SUPERVYZ does the teaching. This eliminates costly after-the-sale handholding.

For further information about EPIC SUPERVYZ, call or write us today.



Supervyz is a trademark of pic Computer Corporation. CP/M is a Trademark of Digital Research.



Epic Computer Corporation 7542 Trade Street San Diego, CA 92121 NOW SOLD THROUGH DISTRIBUTORS IN POPULAR FORMATS 800-421-0814 DEALERS ONLY PLEASE

Circle 163 on inquiry card.



## Japanese Computers

## Japan Maps Computer Domination

Ten-year research and development effort leading to fifth-generation systems for the 1990s is aimed at leapfrogging U.S. technology.

Tom Manuel Computers & Peripherals Editor ELECTRONICS

The Japanese have set out to leap-frog U.S. computer technology and become the world's leading suppliers of advanced computer systems. After two years of study and research, the Japanese Information Processing Development Center—JIPDEC—has hammered out a body of ideas, plans, and recommendations for projects that will culminate in what it calls a fifth-generation system by 1990.

The plan for research and development during the coming decade neatly integrates many of the innovative ideas from researchers in the U.S., Japan, and the rest of the world, extending and fitting them into the new system [ELECTRONICS, November 3, 1981, p. 71].

Reprinted from ELECTRONICS, November 17, 1981. Copyright © McGraw-Hill, Inc., 1981. All rights reserved.

What makes the goal entirely believable is the Japanese ability to turn such efforts into a national project. That gives them, in effect, a na-

Fifth-generation computers will come in sizes ranging from small personal computers to large mainframe computers.

tional computer policy that is concentrated, organized, and possibly government-backed in a way that other countries cannot match.

### Problem Solver

To meet Japan's needs, the computer of the future, in addition to having a higher performance level at lower cost, must be able to handle many more general problem-solving tasks than today's machines. In addition, the system must be as natural for people to use as it is for them to speak. Access is to be through natural language, everyday speech, and pictures. The system that will perform this feat is being called the intelligent-interface machine (see figure 1).

Another of its three basic functions will be the system's ability to learn, associate, and infer, just as people do. The computer will be able to clarify even vague requests and then, by using its vast store of information or that available from other computers, make judgments that will enhance the thinking capacity of its human masters.

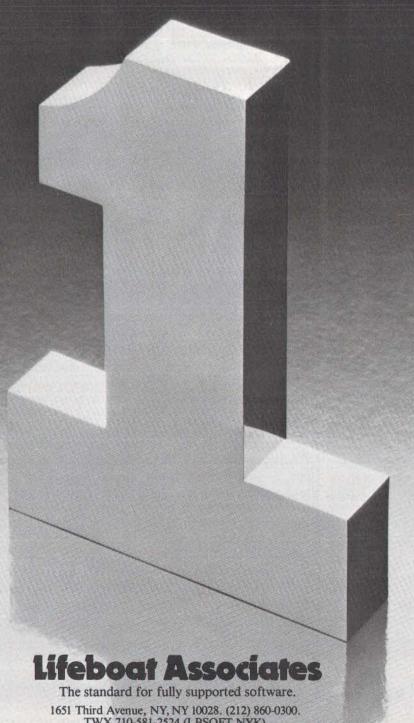
In other words, the computer could carry on an intelligent question-and-

We are dedicated to the achievement of a singular goal... to market fully supported software that sets standards of excellence.

Standards against which all software will be measured. Standards which require that we, as well as the OEM's and authors with whom we labor, constantly offer the state-of-the-art.

Our commitment to being Number One is too strong for

Lifeboat to market anything less.



TWX 710-581-2524 (LBSOFT NYK).

tion problems. Originate/ Answer, Bell 103, Cassette port saves data.



Money back if not delighted

MFJ-1230 INDUCTIVE COUPLED MODEM eliminates room noise, vibration caused by acoustic coupling. Gives more reliable data transfer. Used like acoustic modem, 0-300 Baud, Bell 103 compatible. Originate/answer. Half/full duplex. RS-232, TTL, CMOS compatible. Use any computer. Cassette tape ports save data. 110 VAC or 9 V batteries. Crystal controlled. Carrier detect, power LEDs. 9x1½x4". **MFJ-1231, \$39.95.** Optional cable, software for Apple II, II Plus. Plugs into game port. No serial board needed.

\$QQ95

MFJ-1108 AC POWER CEN-TER. Adds convenience, prevents data loss, head bounce, equipment damage. Relay latches power off during power





It's like having an extra port

MFJ-1240 RS-232 TRANSFER SWITCH, Switches computer between 2 peripherals (printer, terminal, modem, etc.). Like having extra port. Push button switches 10 lines (pins 2.3.4.5.6.8. 11,15,17,20). Change plug or cable to substitute other lines. Push button reverses transmitreceive lines. LEDs monitor pins 2,3,4,5,6,8,20. PC board eliminates wiring, crosstalk, line interference, 3 RS-232 25 pin connectors, 7x2x6 in.

Order from MFJ and try it. If not delighted. return within 30 days for refund (less shipping). One year unconditional guarantee.

Order yours today. Call toll free 800-647-1800. Charge VISA, MC. Or mail check, money order, Add \$4.00 each for shipping and handling.

## CALL TOLL FREE ... 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601 323 5869 outside continental USA and in Mississippi

## **ENTERPRISES** INCORPORATED

921 Louisville Road, Starkville, MS 39759

## Japanese Computers

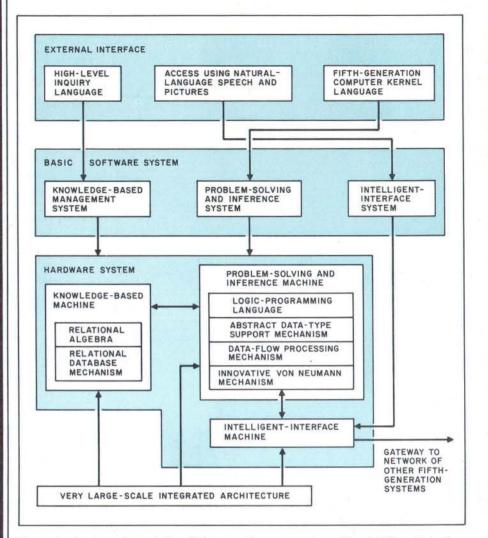


Figure 1: System planned for fifth-generation computers. The intelligent-interface machine will offer natural-language access, the ability to learn and infer, and an understanding of the data it is storing.

answer session with a person. The In All Sizes basic function that will perform this feat is called the problem-solving and inference system, with a separate machine to implement it.

The third basic capability will be the ability to use stored information—the computer will be able to understand the contents of the database instead of just being able to store it, retrieve it, and pass it on. These knowledge bases—as opposed to databases—will feed the problem-solving function.

This part of the tripartite brain will be called the knowledge-based management system. It, like the other two, will have its own specialized machine to use advanced very large-scale integration (VLSI).

Fifth-generation computers are slated to come in sizes ranging from small personal to large mainframe computers. It should be no surprise that they will be interconnected with local and global networks. Some new techniques to be used are new architectures like data-flow machines, artificial-intelligence concepts, and languages such as Lisp and Prolog along with machines optimized for them,

JIPDEC has recommended 26 research and development themes, each with several projects. The themes are grouped into seven categories (see table 1). Each theme has target specifications.

For example, a personal work sta-

# Which personal computer can make you better at what you do best?

TVL	FERGOINE	IBM PC	COMPARATIVE Apple III	HP-87
м	IAXIMUM	256 K	256 K	544 K
M	SOFTWARE SELECTIONS	risiCalc® bata Communications Word Processing  CP/M® 86	VisiCalc® III Data Communications Word Processing Data Base Mgt. Business Graphics  CP/M® Library Apple II Library	VisiCalc* PLUS Data Communications Word Processing Data Base Mgt. Graphics Presentations Statistics (3 pkgs.) Financial Decisions Linear Programming Math AC Circuit Analysis Waveform Analysis CP/M* Library Series 80 Users Library
The second secon	EASE OF USE Programmable Soft Keys Error Messages Built-in Disc Operating Syster Built-in Screen Graphics	10 73 No No	0 38 No Yes	14 107 Yes Yes
Separate Separate	RELIABILITY Self Diagnostics Operating Temperature	yes 61-90°F	No No figures available	Yes 32-133°F

For you, choosing a personal computer means making an intelligent decision.

And isn't that what you do best?

HE BIGGEST MEMORY UE EVER HEARD OF.

The first step in your decision-making process is analysis. You look at all the numbers, and all the facts, before you leap. So you don't want a computer that's going

to run short on memory. Not when you can have the HP-87 and a memory that expands to over half a million bytes.

> Hewlett-Packard will make sure you don't run short on analytical software, either. For example, our VisiCalc® PLUS will let you turn up to 16,000 cells of data into bar graphs,

pie charts or whatever you need to present your results graphically. And our CP/M® module gives you access to the expanding world of CP/M software.

SURE EASY,

We call it HP-Easy. Turn on the HP-87, and it's ready to go. The ROM-based operating system puts our built-in, enhanced BASIC to work for you. Instantly. The HP-87 has built-in commands and

editing keys that eliminate complicated keystroke sequences. Whether you're generating a complex graph, writing a program or correcting errors.

And interfacing peripherals is as easy as putting a plug into a socket. That's the kind of craftsmanship that's putting all our Series 80 computers on the map. We're building power, friendliness and reliability into every one of them. From our portable partner, the HP-85, to the high-powered HP-87.

The most intelligent thing to do now? Get your hands on an HP-87. And then on the competition. You won't have any trouble making the right decision. Not if you want to get better and better at what you do best.

For the HP dealer nearest you, call TOLL FREE 800/547-3400 or in Oregon, Alaska and Hawaii

call 503/758-1010. For additional product information, write Hewlett-Packard, Dept. 276K, Corvallis, OR 97330.

Introducing the new HP-87. It's very good at what you do.



PACKARD

#### Basic-Application Systems

- Machine-translation system
- Ouestion-answering system
- Applied speech-understanding system
- Applied picture-and-imageunderstanding system
- Applied problem-solving system

#### **Development Supporting** Technology

Development-support system

#### Very Large-Scale Integrated Technology

- VLSI architecture
- Intelligent VLSI computeraided design system

#### Distributed-Function Architecture

- Network architecture
- Database machine
- High-speed numericalcomputation machine
- High-level man-machine communication system

#### New Advanced Architecture

- Logic-programming machine
- Functional machine
- Relational-algebra machine
- Abstract data-type support machine
- Data-flow machine
- Innovative von Neumann machine

#### Systematization Technology

- Intelligent-programming system
- Knowledge-based design system
- Systematization technology for computer architecture
- Database and distributeddatabase system

#### Basic-Software Systems

- Knowledge-based management system
- Problem-solving and inference system
- Intelligent-interface system

Table 1: Scope of the fifth-generation project.

tion would be required to perform 2 million instructions per second, have from 0.5 to 5 megabytes of memory, and include 100 megabytes of disk storage with an average access of 1 millisecond. Other specifications include what is referred to as a super high-speed processor to perform from 1 billion to 100 billion floating-point operations per second and have a memory capacity of 8 to 160 megabytes.

#### **Big Numbers**

Designers hope to create a problemsolving and inference function that will have a performance of 100 million to 1 billion logical-inference operations per second (one logical inference equals 100 to 1000 instructions). Another project example is the specifications for a natural-language processing system. In addition, the knowledge-based management function should retrieve a unit of knowledge in several seconds from a knowledge base of 100 to 1000 gigabytes.

Very large-scale integration technologies, first with 1 million transistors per chip and then up to more than 10 million, are to be used. A design-automation system for these integrated circuits will also be developed.

Newer high-speed device technologies such as gallium arsenide and Josephson junctions are excluded from the program because the researchers believe that such devices will not be ready for general use by 1990. However, they do maintain that the progress of these devices will be closely watched so that they can be incorporated into the project at some intermediate stage should they prove sufficiently practical and capable of superior performance.

The design-automation system is to consist of three parts: the software for automated design of VLSI, a computer system to run it—called System 5G-and the 5G personal computer that will be a logic-programming work station for designers. In the initial stage (the first five years) of the project, the planners intend to implement the Hierarchical Specification Language (HSL) now being used at

the Musashino Electrical Communication Laboratory of the Nippon Telegraph & Telephone Public Corp.

The HSL system has several modules that are integrated into a total design system. It contains a language for describing a circuit, compiler, database, timing simulator, logic simulator, circuit simulator, test-pattern generator, placement and routing program, and design-rule checker.

#### Logic Designer

Also part of the design-automation project is the development of the logic-programming work station. No existing personal computer satisfies the requirements of high-speed processing of voice, graphic, and digitized-image input and of performance as a personal-interface machine using languages like Lisp or Prolog. One of the fastest conventional general-purpose computersone capable of 40 million instructions per second—is planned to be the host computer for the design-automation system until the first models of fifthgeneration computers are available.

# DOW JONES BLUE CHIP SOFTWARE GIVES YOU BLUE CHIP INVESTMENT CONTROL.

Never before have investors had the electronic capability to track and intelligently manage their own portfolios like this. Using Dow Jones' data base and exclusive portfolio management software you can store, modify and automatically update individual holdings on your own personal computer.



DOW JONES NEWS/RETRIEVAL is a registered trademark of Dow Jones & Company, Inc.

# INTERESTED?



LET'S TALK

## CONCEPT: PRIVATE COMPUTERS

Our marketplace is maturing. Those of you that were around in 1977 will remember what it took then to make a sale...(anything that worked!)

The two beautiful faces at the left are evidence that changes have occured in the industry!!!

Besides an excellent, well proven S-100, CP/M, Z-80 4MHZ computer system, we have a few extra things to offer. (Not the model!)

Delta specializes in something called a **Private Computer**. It's for those of you systems integrationists that have matured with the market. You stopped assembling systems in your garage a long time ago, but still need a totally flexible computer line that your customers won't find at *Wards* or *Sears*.

- A Private Computer means you will never see one of our computer systems on the shelf of your local department store or computer shop. We only sell to systems integrationists who add value to our product.
- A Complete Range of Products is available. No other micro company in the world offers a more complete line of equipment to satisfy your needs. We have everything from low end single user systems to the top of the line 64 user distributed processing networks.
- The DP Software Library is growing every month. We supply Accounting, Business Management, Code Writing, Medical, Dental, Chiropractic, Word Processing, Property Management and other programs. We have the source code in most cases and can negotiate customization if needed. Video taped training cassetts to aid you and your customers in learning how to use the programs and run the hardware are available.
- Factory Support and Service is available in most large cities. There are 66 fully stocked factory maintainance centers in the U.S. and 12 outside the U.S. In more remote areas, our 24 hour fast turnaround component pool can be used to insure reasonable response times to satisfy customers. We have a customer service Hotline independant of sales or service. We have a 24 Hour Modem Engineering Advisory Billboard.
- Our Engineering Assistance and Software Development Program can make headaches turn into profits. We maintain a staff of Engineers and Programmers whose services can be leased to expand your range of services. Problems from something as simple as hooking up a new printer or modifying an existing software program to customize a screen display can be resolved with this service.
- Financial Assistance is available through a flexible credit program that can not only get the product to you quickly but keep your cash busy where it will do the most good. 30 60 90 day flooring plans can be arranged to allow you to collect your money before you have to pay us.

Sherry Starkey is on line right now at Delta to direct you to your area representative. If you have a half inch Beta or VHS video machine, ask Sherry for a sales demonstration in your own home or office. **See the Plant, the People and the Program.** 

**DELTA PRODUCTS INC.** • 15392 ASSEMBLY LANE, HUNTINGTON BEACH, CA 92649 (714) 898-1492 • MON to FRI - 8 AM to 5 PM • TELEX: 681-367 DELTMAR HTBH

Cirola 120 on insular and

## The Atari Tutorial

#### Part 9: Even More Colors!

Television artifacts and the new GTIA chip allow even more colors to be displayed on Atari computers.

Kathleen Pitta and Lane Winner Atari Inc. 30 East Plumeria POB 50047 San Jose, CA 95134

The Atari 400 and 800 home computers allow the programmer to display many colors with their powerful color-register systems. Even more colors can be obtained with television artifacts and the new GTIA chip.

#### **Television Artifacts**

A television artifact is a pixel on the screen that displays a different color on the screen than the one assigned to it. This happens because the television display signal can become confused. The astute programmer can turn this bug into a feature. The ANTIC modes with which this can be accomplished are 2, 3, and 15. [Remember that the ANTIC mode numbers are not the same as the BASIC "GRAPHICS" n" numbers;

ANTIC mode 15 is not a mistake. . . . G. W.] Each of these modes has a pixel resolution of one-half color clock by one scan line; each has one color and two luminances. With the use of artifacts, pixels of four different colors can be displayed on the screen in each of these modes.

A simple example of artifacts when using the Atari home computer is shown by the following lines of BASIC:

GRAPHICS 8 COLOR 1 POKE 710,0 PLOT 60,60 PLOT 63,60

These statements plot two points on a black background, each with a different color. To understand why these colors are different, you must first understand how the display information for the television display is contained in a modulated television signal.

The two major components of this signal are the *luminance* (or bright-

ness) and the *color* (or tint). The luminance information is the primary signal, containing not only the brightness data but also the timing and synchronization signals. The color signal contains the color information and is combined or modulated onto the luminance waveform.

The luminance of a pixel on the screen is directly dependent on the amplitude of the luminance signal at that point. The higher the amplitude of the signal, the brighter the pixel. The color information, however, is a phase-shifted signal, which is a constantly oscillating waveform that has been delayed by some amount of time relative to a reference signal. This time delay is translated into the color.

The color signal oscillates at a constant rate of about 3.579 megahertz (MHz). The Atari home computer offers a high-resolution graphics mode (GRAPHICS 8) that displays 320 pixels across one horizontal scan line. The hardware does this by varying the amplitude of the luminance signal at 7.16 MHz, which is twice the color frequency. Since the color and lumi-

This article appears in slightly different form in De Re Atari, published by Atari Inc., and is reproduced with its express permission. De Re Atari is available from the Atari Program Exchange, 155 Moffett Park Dr., POB 427, Sunnyvale, CA 94086.

# Announcing the Printing Breakthrough of the Century: Smith-Corona TP-1 Text Printer



## **ACT NOW: Limited Supply, Low, Low Cost**

**Smith Corona,** one of the largest manufacturers of small printers in the world, gives a whole new perspective to printing with their electronic text printer—**TP-1.** The **TP-1** is a microprocessor controlled, high quality **daisy wheel printer.** It produces perfectly formed, executive quality printouts at the speed of 120 words per minute. Typewriter quality printing at dot matrix prices.

Simple, durable and dependable, TP-1 may be used with word processing systems, microcomputers and most small business systems. Compact and attractively



Additional daisy print wheels .... \$4.95



Additional ribbons . .

styled, the **TP-1** blends well with any setting.

Now, all your letters, documents forms and reports can have the crisp, professional look you demand—for business or personal use—at an affordable price. **TP-1**, the electronic text printer.

Don't delay. Order your TP-1 TODAY at the low price of \$845.

Micro Printer Marketing offers same day shipping, nationwide service and invites dealer inquiries. Catalogues available. No shipping charges on pre-paid orders.



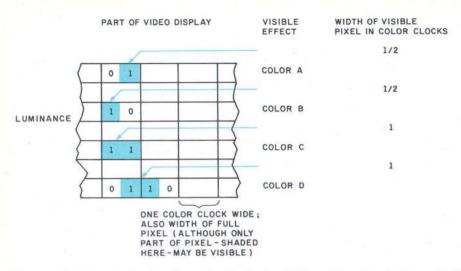
Call Micro-Printer Marketing

TOLL FREE 1-800-523-9859









**Figure 1:** In this example of artifact color pixels, the visible portion of a pixel is one-half color clock wide, and its position within a color clock influences the color produced. See figure 2 and listing 1 for another example of artifact color pixels.

nance signals are theoretically independent, you should be able to assign any background color to be displayed and then vary the luminance on a pixel-by-pixel basis. This is, in fact, the way mode 8 works, the background color coming from playfield register 2 and the luminances coming from both playfield registers 1 and 2.

However, a problem does arise. In practice, the color and luminance signals are not independent. They are part of a modulated signal that must be demodulated by the television receiver before they can be used. Since the luminance is the primary signal, whenever it changes, it also has a drastic effect on the color phase shift. For one or more color clocks of constant luminance this is no problem, since the color phase shift will be unchanged in this area. However, if the luminance changes on a half color-clock boundary, it will also produce a color shift at that point. Moreover, the color obtained cannot be controlled from the transmitting end of the signal (the computer). The artifact color obtained is defined by the settings of the television receiver.

(A color clock is a *physical* unit of horizontal distance on the video display—160 color clocks per line of video display. A pixel is a *logical* unit of video display with a size that varies with the graphics mode in use.

Depending on the graphics mode, a pixel may be one-half, one, two, or more color clocks wide.)

Since the luminance can change on half color-clock boundaries, two artifact colors can be generated, one for each side of the color clock. These two artifact color pixels can be combined to form two additional types of

# The artifact colors are definitely distinct from each other, and programs can be written that utilize them.

full color-clock pixels. This is illustrated in figure 1.

Each of these pixels requires one color clock of screen space (although the visible part of the pixel is one-half color clock). Hence, the resulting display has an effective horizontal resolution of 160 pixels.

The colors A through D are different for each television set, usually because the tint-knob settings vary. Thus, the actual colors obtained cannot be controlled by the programmer. They are definitely distinct from each other, and programs can be written that utilize these artifact colors.

To illustrate a simple application of artifacting, refer to the sample pro-

gram in listing 1. This program draws lines in each of the four artifact colors (see figure 2) and then fills in areas using three of the colors. (Displaying many pixels of either type C or D next to each other results in the same thing: a line of constant luminance with background color.) The POKE 87.7 command causes the operating system to treat this mode as mode 7 instead of mode 8 and to use 2-bit masks when setting bits in the display memory; this tricks the Atari into creating pixels one-half color clock wide. To generate color A, use the COLOR 1 command. The COLOR 2 command produces color B: the COLOR 3 command produces color C. Color D is generated by displaying COLOR 1 to the left of COLOR 2.

#### The GTIA Chip

The new GTIA display chip for the Atari home computer will someday replace the CTIA chip currently in use. The GTIA is nothing more than a CTIA with a few extra features. It provides three additional modes of interpretation of information coming from the ANTIC chip. ANTIC does not require a new display mode to use the special GTIA modes; instead, it uses the high-resolution mode F hexadecimal. GTIA is completely upwardcompatible with the CTIA. A brief summary of the CTIA's features follows so that the differences between the two can be explained.

The CTIA is designed to display data on a television screen. It displays the playfield, players, and missiles. CTIA uses the data from ANTIC to display hue and luminance as defined by the four color registers. The GTIA expands this to use all nine color registers or 16 hues with one luminance or 16 luminances of one hue.

The three graphics modes of GTIA are simply three new interpretations of ANTIC mode F hexadecimal, a high-resolution mode. All three modes affect the playfield only. Players and missiles can still be added to introduce new hues or luminances, or to use the same colors and luminances in more than one way. All displays of hues and luminances can still be changed on-the-fly with



# AN ATARI 800" HOME COMPUTER AND A FATHER'S LOVE COMBINED TO HELP CHILDREN EVERYWHERE.

Fernando Herrera became the first grand prize winner of the ATARI Software Acquisition Program (ASAP) competition because he believed in computers, his son and himself.

The story of Herrera's success began with his son's sight problems. Young Steve Herrera had been born with severe cataracts in both eyes and, naturally, his father was concerned. Herrera reasoned that the boy's learning abilities could be seriously affected by growing up in a world he could not see.

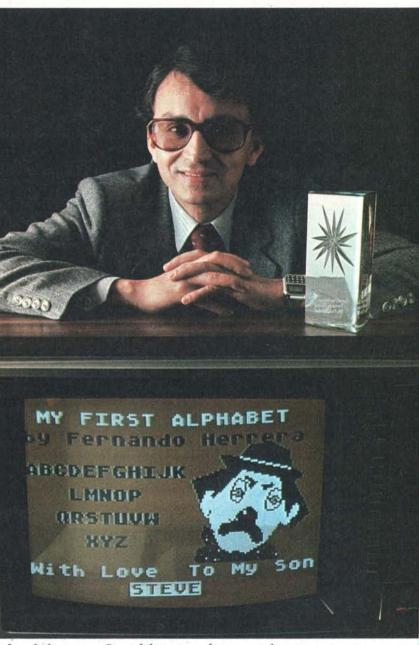
Having just purchased an ATARI 800 Home Computer, it occured to Herrera that this could be the perfect tool for testing Steve's vision. So he wrote a program simply displaying the letter

"E" in various sizes.

Success! It turned out that 2-year-old Steve could see even the smaller "E's" without special lenses. Herrera was first relieved, and then intrigued when he discovered that not only could his son see the "E's," but he would happily play with the computer-generated letters for hours. So Herrera added a picture of an elephant to go with the "E," and then more letters and pictures. Thus, "My First Alphabet"

was born, a unique teaching program for children two-years and older consisting of 36 high resolution pictures of letters and numbers.

Herrera submitted the program to the ATARI Program Exchange, where it became an instant best-seller. ATARI was so impressed with the outstanding design, suitability and graphic appeal of "My First Alphabet," that the program is being incorporated into the ATARI line of software.



In addition to his grand prize winnings of \$25,000 in cash and an ATARI STAR trophy, Herrera also automatically receives royalties from sales of his program through the ATARI Program Exchange.

But Fernando Herrera wasn't the only software "star" that ATARI discovered. Three other ATARI STARS were awarded at the ASAP awards ceremony for software submitted to the ATARI Program Exchange and judged by ATARI to be particularly unique and outstanding.

Ron and Lynn Marcuse of Freehold, New Jersey, teamed up to write three winning entries in the Business and Professional category for home computers: "Data Management System," "The Diskette Librarian" and "The Weekly Planner."

Sheldon Leeman of Oak Park, Michigan, captured an ATARI STAR for his exceptionally well-engineered "INSTEDIT"

character set editor.

Greg Christensen of Anaheim, California, became our youngest ATARI STAR winner at the age of 17. Christensen designed the clever "Caverns of Mars" game program, which also will be incorporated into the ATARI product line. Greg designed the program in 1½ months after owning his ATARI Home Computer for less than a year.

Every three months, ATARI awards ATARI STARS to the writers of software programs

submitted to the ATARI Software
Acquisition Program and judged first,
second and third place in the following
categories: Consumer (including entertainment, personal interest and development);
Education; Business and Professional programs for the home (personal finance and
record keeping); and System Software.

Quarterly prizes consist of selected ATARI products worth up to \$3,000, as well as an ATARI STAR, plus royalties from program sales through the ATARI Program Exchange. The annual grand prize is the coveted ATARI

STAR trophy and \$25,000 in cash.

To be eligible, your software idea must be accepted by the ATARI Software Acquisition Program. Your program can have a broad application or serve a very specific purpose.







After submittal, consultation from ATARI is available if you need personal assistance with sound, graphics, or other technical aspects of your program.

To make your job easier, ATARI provides some 20 software development tools through the ATARI Program Exchange. A list and description of the various system software is published quarterly in the ATARI Program Exchange Catalog. These tools enable you to utilize all the ATARI resources and software, including the six ATARI programming languages.

Fernando Herrera had a great idea that made him a star. ATARI would like to give you the same opportunity.



Circle 32 on inquiry card.

Enter the ATARI ASAP competition and
you could win \$25,000 in cash, royalties,
some great prizes and an ATARI STAR.

SUBMIT TO: ATARI® Software Acquisition Program
Dept. C1R, P.O. Box 427
155 Moffett Park Dr., B-1
Sunnyvale, CA 94086

OR CALL: 800-538-1862; in California, 800-672-1850. I'm reaching for the stars. Please send me an entry form today.

Name		
Address		
City		

#### ATARI HOME COMPUTERS

We've Brought The Computer Age Home.™

Listing 1: An Atari BASIC program to display artifact colors. See the text and figures 1 and 2 for details.

- 10 GRAPHICS 8:POKE 87,7:POKE 710,0:POKE 709,14 20 COLOR 1:PLOT 10,5:DRAWTO 10,70 30 PLOT 40,5:DRAWTO 40,70
- 40 COLOR 2:PLOT 20,5:DRAWTO 20,70
- 50 PLOT 41.5:DRAWTO 41.70
- 60 COLOR 3:PLOT 30,5:DRAWTO 30,70
- 70 FOR X = 1 TO 3:COLOR X:POKE 765.X
- 80 PLOT X+25+60,5:DRAWTO X+25+60,70
- 90 DRAWTO X \* 25 + 40.70: POSITION X \* 25 + 40.5
- 100 X10 18.#6.12.0."S:"
- 110 NEXT X

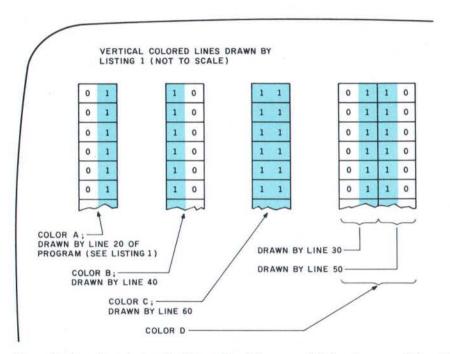


Figure 2: An enlarged view (not to scale) of the upper left-hand corner of the video display produced by listing 1. This figure helps to explain how listing 2 produces four colored vertical lines from three different types of pixels.

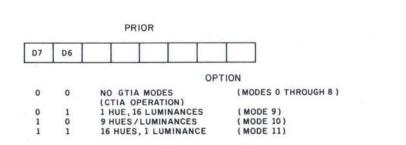


Figure 3: Activation of graphics modes 9, 10, and 11. The two most significant bits of the hardware register PRIOR control the selection of these modes. For information on the use of the low 6 bits of the PRIOR register, see page 338 of the November 1981 BYTE.

display-list interrupts. The GTIA uses 4 bits of data from ANTIC for each pixel, called the pixel data. Each pixel is two color clocks wide and one scan line high. Thus, the pixels are roughly four times wider than their height. The display has a resolution of 80 horizontal pixels by 192 vertical pixels. Each line requires 320 bits (40 bytes) of memory, the same number used in ANTIC mode F hexadecimal. Therefore, for a program to run the GTIA modes, it must have at least 8K bytes of free RAM (random-access read/write memory) for the display.

The GTIA modes are selected by the priority register PRIOR, which is located at address D01B hexadecimal and shadowed at address 26F hexadecimal. [The contents of shadow registers are copied into their associated registers every 1/60 second. Thus, you will usually alter shadow registers, not the hardware registers themselves. . . . G. W. | Bits D6 and D7 are the controlling bits. The effects of these bits are presented in figure 3.

Setting up the new GTIA modes is as simple as setting up the present modes supported by CTIA. To implement the modes from BASIC, simply use a GRAPHICS 9. GRAPHICS 10. or GRAPHICS 11 command. In assembly-language programs, selecting one of these modes is done by opening the screen device through CIO. If you are building your own display list, PRIOR must be set to select the correct mode.

#### Mode 9

Mode 9 produces up to 16 different luminances of the same hue. ANTIC provides the pixel data that selects one of 16 different luminances. The background color register provides the hue. In BASIC, this is done by using the SETCOLOR command to set the hue value in the upper nybble (4 bits) of the background color register and to set the luminance value in the lower nybble to all zeros. The format of the command is

#### SETCOLOR 4, HUEVALUE, 0

where 4 specifies the background

# PUTER WAREHOUS

CALL TOLL FREE

ATARI	
Special 32K 800 Syste	
800 w/32K, recorder, raiders, joysticks	
Above w/48K	Call
800 (16K)	\$670
400	S340
810 Disk Drive	\$440
825 Printer 850 Interface	\$170
410 Recorder	S 75
830 Modem	S155
16K Memory	\$70
COMMODORE	. 3123
VIC 20	\$250
DISK DRIVES	
Lobo	
Apple 1st Drive	\$400
Apple 2nd Drive	5350
PRINTERS	
C. Itoh F-10 — Parallel	Call
F-10 - Serial	Call
55CPS — Series	Call
Prowriter	Call
1550	Can
DS 180	S1260
Diablo	
	\$2260
630 RO wo/Tractors .	\$2050
COUNCIT WO/ Hactors .	52435
Epson MX-80	Call
MX-80 F/T	Call
MX-100	Call
NEC	
PC-8023A	Call
7710	Call
7710 7720	Call
Okidata	
Microline 80	\$330
Microline 82-A Microline 83-A	\$455
Microline 84	Call
Tally	
1805/1802	\$1555
1605/1602	\$1325
Texas Instruments	
810 Basic	Call
MONITORS	
Zenith 12" Green Screen	S115
Amdek	

Video 100

Video 300.

Color I.....

INTERNATIONAL DEALER INQUIRIES INVITED



#### SPECIAL WORD PROCESSING SYSTEM

Altos 8000-2, Televideo 950, Diablo 630RO, Word Star, Cables . . . . . . . above w/TELEVIDEO 910 ...... \$5500

#### **VIDEO TERMINALS**

Adds Viewpoint	S530
Altos	
Altos I	Call
Soroc	-
IQ 120	Call
IQ 130	
IQ 135	
IQ 140	Call
Televideo	
910 C	
912 C	\$675
920 C	\$735
925 C	\$730
950 C	\$915
<b>Zenith</b> Z-19	
DISKETTS	
Elephant	
5¼" 0. Sector (100)	\$215
Maxell	
51/4" 0. or 10. Sector	
(100)	<b>S300</b>
8" 0. Sector (100)	\$370
SOFTWARE	
WordStar	S295
Mailmerge	
SpellStar	
DataStar	
CalcStar	

#### COMPUTERS

COMPOSENS	
Altos	
ACS 8000-15	\$3850
ACS 8000-2	COCEO
w/CPM*	\$2050
Series 15D	
Series 5-5D	Can
Alspa	0-11
ACI-1	Call
ACI-2	Can
California Computer	
Systems	Call
IBM	
Personal Computer	
NEC	Call
Northstar	AUSTRALIA MARANA
Advantage	\$2990
Horizon II 64K QD	\$2690
Televideo Systems	
TS-802	\$2700
TS-802H	\$5050
Zenith	
Z-89 48K w/CPM* Z-90 64K w/CPM*	\$2160
Z-90 64K w/CPM*	\$2385
Both above w/supercal	lc
MODEMS	
Novation	
CAT	\$140
DCAT	C455



2222 E. Indian School Rd. . Phoenix, Arizona 85016

Order Line: 1-800-528-1054 Other Information: 602-954-6109



Apple Cat II ........... \$349

Auto Cat .....



Store Hours: Tues.-Fri. 10-5 MST Saturday 10-2 MST

Call

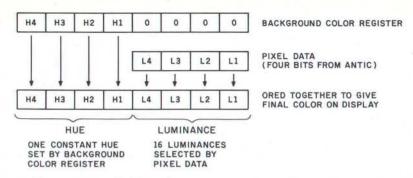


Figure 4: Interpretation of a byte of memory as a color pixel in graphics mode 9. Mode 9 gives one hue at 16 possible luminances.

Listing 2: An Atari BASIC program that illustrates BASIC graphics mode 9 by drawing 16 vertical lines of varying luminances (same hue).

10 GRAPHICS 9

20 SETCOLOR 4,12,0:REM initialize the background color to green

30 FOR I=0 TO 15:REM draw in different luminances

40 COLOR I

50 PLOT 2\*I,10

60 DRAWTO 2-1,80

70 NEXT I

80 GOTO 80:REM hang up in a loop

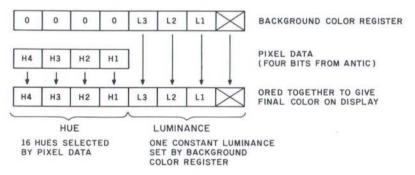


Figure 5: Interpretation of a byte of memory as a color pixel in graphics mode 11. Mode 11 gives up to 9 hues at the same luminance level.

Listing 3: An Atari BASIC program that illustrates BASIC graphics mode 11 by drawing 16 vertical lines of varying hues (same luminance).

10 GRAPHICS 11

20 SETCOLOR 4,0,12:REM initialize the background color

30 FOR I = 0 TO 15

40 COLOR I:REM select different colors

50 PLOT 2\*I,10

60 DRAWTO 2+1,80:REM draw bars in different colors

70 NEXT I

80 GOTO 80

color register, HUEVALUE sets the hue and can be anything from 0 to 15, and 0 sets the luminance part of the register to zero. The background luminance must be zero because the pixel data from ANTIC will be logically ORed with the lower nybble of the background color register to get the luminance that appears on the screen (see figure 4). Use the COLOR command to select luminances for drawing on the screen; its argument (ranging from 0 to 15) specifies the luminance. A sample BASIC program to use mode 9 is shown in listing 2.

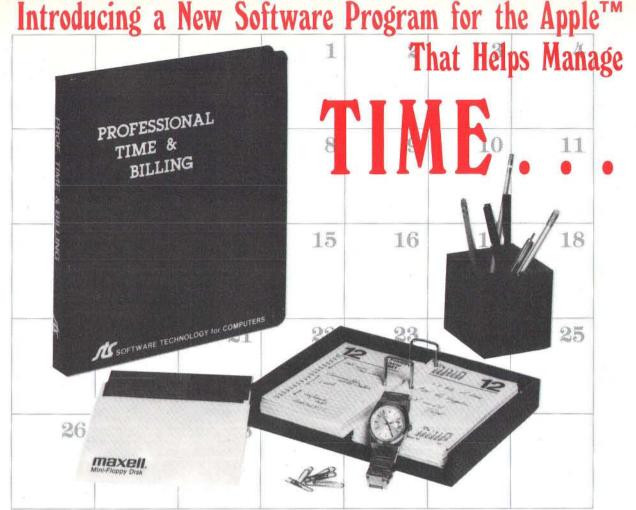
Assembly-language programs should write the hue directly into the upper 4 bits of the shadow location for the background color register at location 2C8 hexadecimal. If you use CIO calls to draw to the screen, store the pixel data into ATACHR located at 2FB hexadecimal. This selects the luminance with values from 0 to F hexadecimal. If you are maintaining your own display data, the pixel data goes directly into the left or right half of the display RAM byte.

#### Mode 11

Mode 11 is similar to mode 9 except that it provides 16 different hues all with the same luminance. ANTIC provides the pixel data to select one of 16 different hues (see figure 5). In BASIC, use the SETCOLOR command to declare the single luminance value in the lower nybble of the background color register. Set the upper nybble of the background color register (the hue nybble) to zero. The format of the command is

#### SETCOLOR 4,0,LUMVALUE

where 4 specifies the background color register, 0 sets the upper nybble to zero, and LUMVALUE sets the value of the luminance and can range from 0 to 15. As with the other graphics modes (except mode 9), the lowest bit of the luminance is not used. The effective result is that only even numbers result in distinct luminances, which gives eight possible luminances in this mode. Use the COLOR command in this mode to select the various hues by selecting values from



Every Minute Counts.
When you charge for time, every minute counts. Counting up the charges, determining accountability for your services, making billing decisions—your livelihood depends on these tasks. Time itself and the cost you assign to it—are the real commodities of the professional practitioner.

Performs Like a Service Bureau. The Professional Time & Billing

program performs time management and billing functions as expertly, efficiently and smoothly as a prestigious service bureau but at a fraction of the cost! With the PTB program, turnaround time is virtually eliminated. Instant access to information and the ability to make quick, effective billing decisions are virtually at your fingertips. With delays eliminated, your cash flow will increase significantly.

Designed by Professionals.
The Professional Time & Billing

program by SOFTWARE TECHNOLOGY for COMPUTERS was designed by professionals who understand that time is money. Their purpose in creating this program is to give you the best possible return on your time.

PTB Will Help Your Firm.

The PTB program will keep accurate records of WHICH staff member performed WHAT work for WHICH client. Up to 120 user-defined rate codes of time, expenses or fixed fees can be used. Even nonbillable work and non-time-related expenses can be recorded. The program provides accurate records of monies received from clients on account or other receipts you may want to record. The PTB program will correlate all this information, assemble a comprehensive set of internal reports, and generate statements for services rendered.

The System Will Pay for Itself.

The PTB program will more than pay for itself by increasing the speed, accuracy and efficiency of your client accounting and billing procedures.

Who Needs the PTB Package?

CPA firms, law practices, advertising agencies, architectural firms, engineering companies, private consultants, health care centers and countless others that depend on the ability to accurately and meaningfully manage billable time and resources.

All This with Incredible Ease for \$395 (U.S.).

The Professional Time & Billing program requires no previous background in computers or programming. Extensive documentation and detailed explanations of how the system works provide an unparalleled level of trouble-free, user-oriented performance. Furthermore, you can learn to use the program in a minimal amount of time.

The complete package costs \$395 (U.S.) and includes a 3-ring binder, program diskette and user's manual. The program will run on an APPLE II or II Plus computer with 48k, a serial or parallel printer and 2 disk drives. No other special hardware add-ons are required.

For a Personal Demonstration.

For a personal demonstration of this outstanding program and other fine products from us, contact your local dealer. Call or write us for the whereabouts of your local dealer at:

> SOFTWARE TECHNOLOGY for COMPUTERS P.O. Box 428 Belmont, MA 02178 (617) 923-4334 "THE DIFFERENCE LIES WITH THE SOFTWARE"

If your local dealer does not carry the PTB program ask him to give us a call. We are committed to providing quality software at reasonable prices.



Delphic Systems has merged its Z80 BASIC with FairCom's MICRO B+™ to produce BASIC B+™, the first all purpose interpreter featuring a B-TREE file structure implemented using NEW commands. No more messy CALLs or difficult assembly language interfacing! Instead, use the following BASIC B+™ functions to manage an index without ever reorganizing the file:

In addition, **BASIC B**+<sup>™</sup> was written using Z80 code in order to minimize size and enhance speed performance.

#### Features & Requirements

- Search a 10,000 entry index in one second
- No index reorganization needed
- Uses fast and compact Z80 code
- CP/M® Versions 1.4 or 2.2
- 12 Digit precision
- Program Chaining
- Read only file protection
- Sequential and random files



COLOR Statement Value	Address of Color Register Used (Hexadecimal)	Address of Operating-System Shadow Location (Hexadecimal)		
0	D012	2C0		
1	D013	2C1		
2	D014	2C2		
3	D015	2C3		
4	D016	2C4		
5	D017	2C5		
6	D018	2C6		
7	D019	2C7		
8	D01A	2C8		

**Table 1:** Addresses of color registers and their shadow locations affected by the COLOR statement in BASIC.

**Listing 4:** An Atari BASIC program that illustrates BASIC graphics mode 10 by drawing 16 vertical lines of varying hues and luminances.

- 10 GRAPHICS 10
- 20 FOR I=0 TO 8
- 30 POKE 704+1,255\*RND(I):REM set random colors
- 40 COLOR I
- 50 PLOT 2+1,10
- 60 DRAWTO 2+1,80:REM draw in bars of color
- 70 NEXT I
- 80 GOTO 80:REM hang up in a loop

0 to 15 for its argument. The pixel data from ANTIC will be logically ORed with the upper nybble of the background color register to set the hue part of the value that ultimately generates the color on the screen. A sample BASIC program using mode 11 is presented in listing 3.

In assembly language, use the operating-system shadow location for the background color register (at 2C8 hexadecimal) to set the luminance in the lower 4 bits with values from 0 to F hexadecimal. If you use CIO calls to write to the screen, store the pixel data to be written into ATACHR located at 2FB hexadecimal. This selects the hue with values from 0 to F hexadecimal. If you are maintaining your own display data, the pixel data goes directly into the left or right half of the display RAM byte.

#### Mode 10

Mode 10 allows all nine color registers to be used in the playfield at one time. Each color register to be used must be set to some combination of hue and luminance. The pixel data from ANTIC is used in this mode to select one of the color registers for

display. In BASIC, the SETCOLOR command can be used as described in the Atari 400/800 BASIC Reference Manual to set the colors in the background and the four playfield registers. These can also be set by using the POKE instruction to addresses 708 through 712 decimal where the four playfield registers and the background register are located. The POKE instruction must be used to set the four player/missile color registers at locations 704 through 707 decimal. The COLOR command is used to select the color register desired, as shown in table 1. The only meaningful values for its argument are 0 to 8. A problem arises with this mode. ANTIC supplies 4 bits of data per pixel, as it does with modes 9 and 11. This allows for the selection of 16 color registers. However, only nine color registers exist in the hardware. An illegal data value between 9 and 15 will select one of the lower-value color registers. A sample BASIC program using mode 10 is given in listing

In assembly language, store the pixel data into ATACHR (location 2FB hexadecimal) or directly into the

# Our attitude is priceless. Our training is free.



Cut out for business.

Circle 388 on inquiry card.

to work.

Cut out for Alabama where people are

trained to your specifications and ready

## CP/M SOFTWARE

LARGEST SELECTION IN U.S.A.

dBASE II Ashton-Tate	QUICKSCREEN Fox & Geller	WORDSTAR Micropro
<sup>5</sup> 595	<sup>5</sup> 149	\$2 <b>9</b> 9
<b>CB-80</b> ® Compiler Systems	SUPERCALC <sup>®</sup> Sorcim	SPELLBINDER® Lexisoft
<sup>5</sup> 419	<sup>5</sup> 239	\$2 <b>99</b>
SPELLSTAR Micropro	MAILMERGE Micropro	T/MAKER® Lifeboat Assoc.
<sup>5</sup> 169	\$99	\$22 <b>9</b>
ACCOUNTING PLUS® Systems Plus	CALCSTAR® Micropro	BASIC ® COMPILER Microsoft
CALL	\$219	\$32 <b>5</b>
BASIC 80 Microsoft	CONDOR 1® Condor	FMS-80 <sup>®</sup> Systems Plus
<sup>5</sup> 284	\$239	\$649

#### **SAVE ON HARDWARE**

TELEVIDEO 910. TELEVIDEO 950 C. ITOH STARWRITER C. ITOH PROWRITER IDS 560G	\$955.00 \$1429.00 \$559.00	MICROSOFT SOFTCARD ALTOS PRODUCTS ZENITH PRODUCTS C.C.S. PRODUCTS ARCHIVES PRODUCTS	LESS 20% LESS 20% LESS 20%
100 3000	\$1000.00	XEROX COMPUTERS	

CP/M is a Trademark of Digital Research



617-963-7220

ORDERS ONLY - 1-800-343-8420

WARE - HARDWARE - SUPPLIES - DISCOUN

display RAM byte, as in modes 9 and 11. In this mode, the pixel data can range from 0 to 8 and selects one of the nine color registers.

#### Advantages and Disadvantages

An important question arises in conjunction with GTIA concerning compatibility. GTIA is fully upwardcompatible with the CTIA, and all software that runs on a CTIA system will run the same way on a system with GTIA. This means you still have full use of players and missiles, collision detection, and display-list interrupts. The GTIA graphics modes are supported by the operating system, and all graphics commands and utilities that run in the CTIA modes can be used in GTIA modes.

<u> SOFTWARE - HARDWARE - SUPPLIES - DISCOUNT PRICES</u>

<u> SOFTWARE - HARDWARE - SUPPLIES - DISCOUNT PRICES</u>

The GTIA allows the programmer to display more colors on the screen with less work. Sixteen colors can be shown on one horizontal line. This is better than what can be done with horizontal kernels (see "The Atari Tutorial, Part 4: Display-List Interrupts," December 1981 BYTE, page 181) that can give a maximum of 12 colors per horizontal line. Much finer contour and depth can be represented using the shading available in mode 9. This means three-dimensional graphics can be realistically displayed.

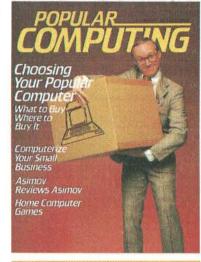
Some disadvantages are associated with use of the GTIA chip. GTIA modes are map modes; text cannot be displayed in these modes without recourse to custom display lists. The GTIA pixel is a long, skinny horizontal rectangle (4:1 ratio, width to height) that does not represent curved lines well. Because each pixel uses 4 bits of information, GTIA requires nearly 8K bytes of free RAM to operate. Although it is upwardcompatible, it is not downwardcompatible. Thus, programs that use GTIA modes will not produce correct displays on computers that have CTIAs. There is no way currently for a program to determine whether or not a GTIA is present in a system. Finally, color artifacts produced by a GTIA system will not be identical to the color artifacts produced on the same television with a CTIA system.



#### Introducing "Popular Computing," the key to understanding.

Now you don't have to be a computer professional to unlock all the mysteries, potential, and pleasures of home and small business computers. Popular Computing, the new monthly magazine from McGraw-Hill, is the key.

Created in response to growing demand for our informative quarterly on Computing, Popular Computing explores every aspect of personal computers and their use. All reported in easy-tounderstand nontechnical language.



#### The answer to "Computerphobia."

Even the most computerunsophisticated reader will find Popular Computing interesting and stimulating. Every issue will contain straighttalking product reviews,

special news briefs, and feature articles by famous guest contributors (like Isaac Asimov). There'll even be a helpful glossary of computer jargon we couldn't avoid using, and much, much more.

#### Special Introductory Offer.

Send in this coupon today, and take advantage of Popular Computing's Special Introductory Offer.



Check Englosed for \$11.97 Check Fix Cosed for \$11.41

THE KEY TO UNDERSTANDING P.O. Box 397, Hancock, NH 03449

# Ports of Entry and Soft Breezes for the Color Computer and Model III

A \$10 Anemometer and Other Remote Sensing Projects Using the Cassette Interface

> William Barden Jr. 28122 Orsola Mission Viejo, CA 92692

In the last article of this series, I discussed using the cassette output of the Model I and Model III as a single discrete output line to drive a music synthesizer, telephone dialer, and serial port. This month I'll look at the inverse—implementing discrete (binary) inputs on the Color Computer and Model III. (Unfortunately, the schemes I'll be using are not applicable on the Model I, so it will be slighted somewhat in this article.)

Of course, it's possible to implement dozens of discrete input lines to the Model I, Model III, or Color Computer by using a peripheral interface adapter (PIA) or peripheral input/output (PIO) device such as the 8255 semiconductor chip. This method requires four or five integrated circuits in addition to the PIO or PIA.

The approaches I'll discuss here, however, involve using few additional components other than sensors. This cheap and dirty approach can be used to detect remote switch

The anemometer is constructed with plastic sprinkler fittings, wooden dowels, and plastic cups. Do some preliminary testing before using it atop a 200-foot tower.

closures (e.g., in burglar alarms and fire detectors); it can even be used to receive serial data (e.g., pulses generated by a telephone-type rotary dial). Discrete line inputs can also serve as a frequency counter. With the proper sensors and software, you can implement a low-frequency counter that easily measures thousands of counts per second; the software can handle switch bounce too.

As an example of a practical application of this discrete line input, I'll show you how to construct an anemometer that will measure wind speeds from  $2\frac{1}{2}$  to over 60 miles per hour. Believe it or not, this device costs less than \$10 and can be made by hackers without opposing thumbs.

#### Where Are the Discrete Inputs?

Looking at the Color Computer, you can spot several potential discrete inputs: two joystick jacks, a cassette jack, and an RS-232C jack.

# Lack of ZX81 memory giving you headaches.?



#### The Memotech 64K Memopak

The growth of interest in computer use caused by the introduction of the Sinclair ZX81 has made new and exciting demands on the ingenuity of electronic engineers. At Memotech we have focused our attention on the design of an inexpensive, reliable memory extension.

The Memopak is a 64K RAM pack which extends the memory of the ZX81 by a further 56K. Following the success of our 48K memory board the new memory extension is designed to be within the price range expected by Sinclair users. It plugs directly into the back of the ZX81 and does not inhibit the use of the printer or other add-on boards. There is no need for an additional power supply or for leads.

The Memopak together with the ZX81 gives a full 64K, which is neither switched nor paged, and is directly addressable. The unit is user transparent and accepts such basic commands as 10 DIM A(9000)

0-8K ...Sinclair ROM

8-16K...This section of memory switches in or out in 4K blocks to leave space for memory mapping, holds its contents during cassette loads, allows communication between programmes, and can be used to run assembly language routines.

16-32K...This area can be used for basic programmes

and assembly language routines.

32-64K...32K of RAM memory for basic variables and large arrays. With the Memopak extension the ZX81 is transformed into

a powerful computer, suitable for business, leisure and educational use, at a fraction of the cost of comparable systems.

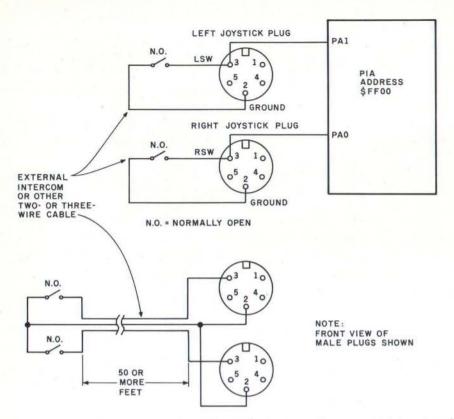




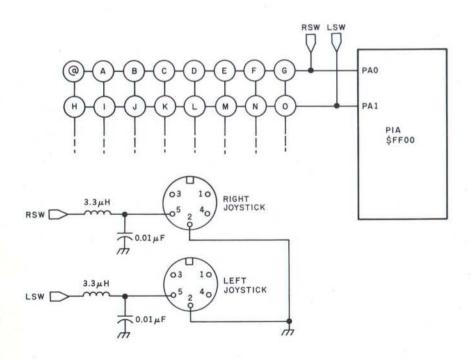
Please make cheques payable to: Memotech Corporation

Memotech Corporation 7550-Westyale Äve No. 220, Denver, COLORADO 80227. Tel (303) 986 0016

Please debit my MASTER CHARGE VISA *	Please rush me:	Quantity	Price	Tota
VISA * account number:	64K RAM, Assembled		\$179.95	
Please delete whichever does not apply				
Signature				
Date	_			
NAME				
ADDRESS			Postage	\$4.00
		POCI	TOTAL	



**Figure 1:** The Color Computer joystick switch inputs can be connected to external single-pole, single-throw (SPST) or single-pole, double-throw (SPDT) switches for remote sensing applications. Cable runs can be up to 50 feet.



**Figure 2:** The Color Computer joystick switch inputs are "wire ORed" to two keyboard rows. Since the keyboard is never used at the same time as the switches, this causes no sensing problems.

Joystick switch inputs. The left and right joysticks have four analog channels that could be used as discrete inputs. Even more promising, however, are the joystick "switch" inputs.

The joystick switches (shown in figure 1) are normally open switches that close to ground. The output of each switch goes to bit 0 (right joystick) and bit 1 (left joystick) of PIA address hexadecimal FF00. As you can see from figure 2, the switch inputs to the PIA are shared by two keyboard rows; normally, you wouldn't be using the keyboard and joystick switches at the same time. The joystick switches connect to the PIA through a small filter made up of a choke and bypass capacitor as shown in the figure: this eliminates some input noise.

Substituting an external switch (or switches) for the joystick switches, a cable can be run 50 feet or more to a remote location. This procedure is not generally recommended with an unterminated input, but I experienced no difficulties and no false readings in a home environment with a 60-foot intercom cable.

The program used is shown in listing 1, which simply checks for a 1 or 0 on either joystick input. This Extended Color BASIC program loops at about 30 senses per second, making the scheme fine for switch closures in burglar alarms, fire detectors, microswitches in mailboxes triggered by the weight of the mail, and so forth. At this point it's probably well to mention a typical switch that can be used for remote sensing. Radio Shack has submini lever switches with and without rollers (275-017 and 275-016, respectively), which require about 50 grams of force to operate. These switches were used in the applications described here, although virtually any single-pole, doublethrow (SPDT) switch could be used.

RS-232C input. Another possibility for a discrete input on the Color Computer is the RS-232C read (RD) input. This line is normally used to input serial data and, as figure 3 shows, it connects to an LM339 comparator in the Color Computer. One input to the comparator is a voltage divider made up of a 15-kilohm ( $k\Omega$ )

# COBOL the language of business. The language of Micro Focus

# CIS COBOL

Our CIS COBOL product family brings you the most successful business programming tool ever devised, COBOL, in a form optimized for today's most cost effective hardware, the microcomputer. Standard COBOL as defined by ANSI X3.23-1974.

The reliability and performance of CIS COBOL are strongly emphasized by its' continued qualification for U.S. government contracts. In January 1981 CIS COBOL entered its 2nd year of G.S.A. certification.

CIS COBOL is powerful but simple to use. Its screenhandling, dynamic module loading and fast ISAM let you take full benefit from micro computer facilities.

Our FORMS-2 utility is a COBOL source code generator to help you build interactive applications with ease. Using our unique demonstration "How to create a COBOL program in 20 minutes," you can quickly try out new application ideas.

And if you are developing software for resale, the variety of systems running CIS COBOL offers you a very large available market.



CIS COBOL and FORMS-2 are trademarks of Micro Focus. 8080 is a trademark of Intel Corp. 280 of Zilog. LSI-11 and PDP-11 of Digital Equipment Corp. Apple I of Apple Computer. Softcard of Microsoft Consumer Products, CP/M of Digital Research and UNIX of Bell Laboratories.

CIS COBOL and FORMS-2 are available through our dealers and distributors for many 8080, Z80 and LSI-11 systems including Apple II with Softcard and CP/M.

For OEM purchase on 8086, PDP-11, UNIX and other order codes approach us direct. Our system transfer technology has made CIS COBOL first on a number of processors and enabled us to interface to 30 different operating systems.

For more information about CIS COBOL fill in the coupon below.

Santa Clara, C	nc. 1601 Civic Center Drive, la 95050, USA. 496 0176. Telex: 278704 MFCIS UR
Please send me	
A brochure	on CIS COBOL
A brochure	on FORMS-2
A set of App	olications Notes
(Qty) (inc. p+p) for w	CIS COBOL manual(s) at \$75 hich I enclose a check
My chief interes	t is in; (please tick box)
8080	
8086	
UNIX	
Apple II	
Name	
Position	
Company	
Address	
Tel No	

Listing 1: Sample Color Computer BASIC program for reading joystick switch closures.

100 ' SWITCH CLOSURE FOR RIGHT AND LEFT JOYSTICK 110 INPUT "RIGHT(R) OR LEFT(L) DETECT";A\$ 120 IF A\$="R" THEN M=1 ELSE M=2 130 A=(PEEK(&HFF00) AND M) 140 IF A=M THEN PRINT "OFF" ELSE PRINT "ON" 150 GOTO 130

Listing 2: Sample Color Computer BASIC program for reading RS-232C RD inputs.

100 ' SWITCH CLOSURE FOR RS-232-C RD INPUT 110 A=(PEEK(&HFF22) AND 1) 120 IF A=0 THEN PRINT "ON" ELSE PRINT "OFF" 130 GOTO 110

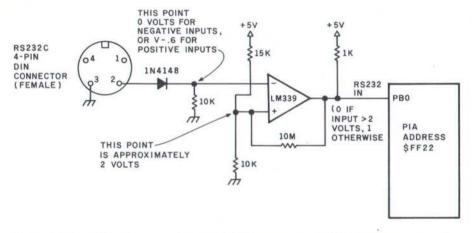
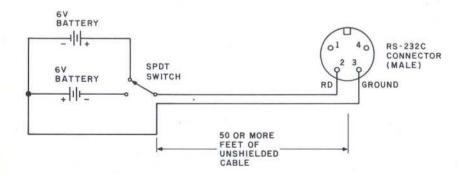


Figure 3: The Color Computer RS-232C RD input goes to an LM339 comparator via a diode. Output of the comparator is a logic 0 for positive signals and a logic 1 for negative signals.



**Figure 4:** Two 6-V batteries can be connected to an SPDT switch to implement a remote sensing switch connected to the Color Computer RS-232C port.

and a 10-k $\Omega$  resistor. The junction point is a constant +2 volts (V) and goes to the "+" (plus) input.

The "-" (minus) input connects to the external RD line via a common diode and 10-kΩ resistor to ground. RS-232C signals are normally above +3 V (logic 0) or below −3 V (logic 1). When the RD line is more positive than about +2.6 V, the input forward-biases the diode, and the "-" input is greater than the "+" input, producing a logic 0 comparator output. When the RD line is negative, the diode is reverse-biased, and the output of the comparator is logic 1. The comparator output goes to bit 0 of a PIA whose address is hexadecimal FF22. Reading bit 0 of PIA hexadecimal FF22 is a process similar to reading the joystick switch, as shown in listing 2.

Figure 4 shows the connections for the RS-232C remote input. Tie the normally closed contact of the switch to the positive terminal of a 6-V battery. Tie the normally open contact of the switch to the negative terminal of a second battery. Tie the opposite ends of the batteries together and to the ground lead of the RS-232C connector. The common contact of the switch goes to the RD line. There will be some switch bounce when the switch is broken (on the order of 50 or 60 milliseconds [ms]), but this arrangement is fine for slow sensing.

Again, this scheme was implemented using ordinary two-conductor cable without termination and with a 60-foot run in a home environment. No false readings were detected. Twisted-pair cable could be used to increase the noise immunity. As this method is essentially current-driven rather than voltage driven, runs even longer than 60 feet should be possible.

Cassette input. Now for the third method of implementing a discrete input: using the cassette input. Examination of the Color Computer and Model III shows that the same scheme, a comparator input, is used for both the Color Computer and Model III 1500-bps (bits per second) cassette inputs. (The Model I and Model III 500-bps cassette inputs use



# Chart your financial future with MicroFinesse

In this fast-paced business world, the best way to stay competitive is to be able to see your financial alternatives clearly and make decisions fast.

That's why P-E Consulting Group Ltd. developed MicroFinesse, a complete package providing professional financial forecasting PLUS full high-

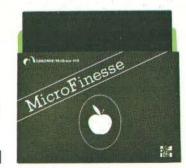
resolution color graphics support, including pie charts, histograms and graphs, for the financial projections you create.

Now this evolutionary financial resource planning tool eliminates the timeconsuming reprogramming required for financial model consolidation or expansion. Micro-Finesse's menu-driven command format can also generate up to 15 userdefined reports per model, with visuals, without reprogramming.

Previously available only for mainframe applications, the MicroFinesse program can now be purchased at

leading Dealers nation-wide. MicroFinesse is specifically designed for the 48K Apple II® with the Apple Language Card.

So when your variables are many and your time is limited, take a good look at the financial artistry of MicroFinesse.



## **MicroFinesse**

Distributed by: OSBORNE/McGraw-Hill 630 Bancroft Way, Berkeley, CA 94710, (415) 548-2805





## Minicomputer performance in

Multi-user. Multi Tasking. Decision I™ memory management hardware includes a memory map that is similar to the IBM 360,® and IBM 370.® It supports up to 16 tasks or 15 users and a supervisor without swapping. And, more with swapping. Each task or user enjoys complete memory protection and dynamic memory allocation. One task may be delegated as a supervisor to privileged system functions forbidden to ordinary tasks or users. Such functions (I/O calls, unauthorized memory access, etc.), will trap to the supervisor. If supervisory functions are not required the system can be configured for turnkey multi-user operation.

Multi-purpose IEEE696/S-100. Decision I utilizes the Morrow Designs IEEE Standard S-100 Wunderbuss. That means you can configure it to your specific applications. Add a floating point processor, add memory (to a full mega-

byte), add I/O, add controllers...add boards from dozens of manufacturers. And S-100 has a major advantage over single-board computers: If a board goes down, you simply replace it. And keep running. If you want to expand your system. Add boards

and terminals.

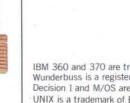
An unmatched software base.

Decision I runs on the M/OS™ operating system. M/OS supports all system calls source

compatibly with UNIX. Thus, UNIX programs will compile directly and UNIX documentation is almost totally applicable. Morrow CP/M has been configured to run under M/OS and communicate with both CP/M and UNIX standard media for maximum portability. Languages available include BASIC, COBOL, FORTRAN, RATFOR, Pascal and C. That means Decision I offers you a software base unmatched in its price/performance arena.

The OEM machine. A basic multi-user system at \$5,225 includes the Decision I, 4 Mhz Z80A-based CPU.

sophisticated memory



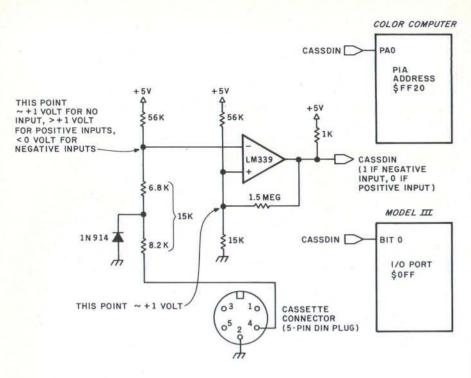
IBM 360 and 370 are trademarks of IBM Corp.
Wunderbuss is a registered trademark of Morrow Designs
Decision I and M/OS are trademarks of Morrow Designs
UNIX is a trademark of Bell Laboratories, Inc.
CP/M is a trademark of Digital Research Corp.



## a multi-user Microcomputer.



Circle 290 on inquiry card.



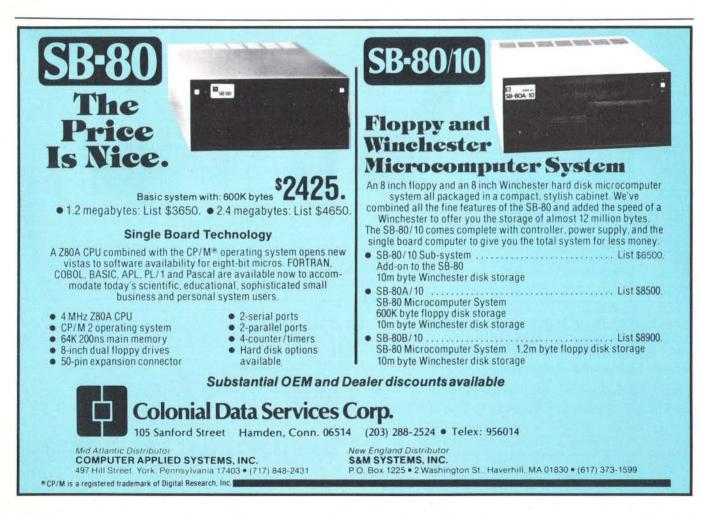
**Figure 5:** The Color Computer and Model III have identical 1500-bps cassette input logic. An LM339 comparator compares a fixed reference voltage to the cassette data input. Output of the comparator is a logic 0 for positive signals and a logic 1 for negative signals.

a different scheme, one of rectifying pulses. That arrangement is not as functional for random inputs as the one discussed here.) As a matter of fact, the input circuits in the Color Computer and Model III 1500-bps cassette interfaces are identical (see figure 5).

A frequency-shift keying method is used to generate the cassette waveform. A different frequency is used for a 0 and a 1 bit, as shown in figure 6. The Color Computer or Model III firmware measures the frequency of the sine wave by checking the binary output of the LM339 comparator, as shown in the figure.

One input to the LM339 is a fixed voltage of about +1 V from the junction of the 56-k $\Omega$  and 15-k $\Omega$  voltage divider. The second input is from a similar voltage divider. In the latter case, however, a diode goes to ground at the junction of the 6.8-k $\Omega$  and 8.2-k $\Omega$  resistors.

Input from the cassette recorder is an alternating current (AC) signal,



## "GE'S ENERGY AUDIT DIAGNOSED OUR LIGHTING NEEDS AND SAVED US \$17,688."



Robert O'Herron, Vice President of Facilities, Akron General Medical Center.

"I'm always looking for ways to cut costs. That's why I was very interested in General Electric's lighting energy audit.

"I simply filled it out, marking in the number of each type of lamp we use. GE then calculated that we could save more than \$68,000 annually in energy costs with GE energy-efficient lamps.

"We immediately changed one-fourth of our lamps to Watt-Miser® II fluorescents from GE. What's more, we did this without refixturing. Which meant a substantial \$17,688 savings in annual energy costs with no capital investment."

The GE energy audit may be able to save you a lot of money, too. Just fill out the form below and mail

it in.

You'll receive a personalized computer analysis, showing your potential savings.

The GE energy audit. Let it make the right diagnosis for you.

WE BRING GOOD THINGS TO LIFE.



C-202

#### SEE WHAT YOU CAN SAVE WITH GE'S FREE LIGHTING ENERGY AUDIT.

Fill out this form and mail to General Electric Company, Lighting Energy Audit, Department PMN1D, Nela Park, Cleveland, Ohio 44112.

Now in use	Total Number	Hours each lamp operates per week		
Standard Fluorescen 12 4' F40/RS 20 8' F96	its		My energy rate is \$0. per kilowatt hour. (Divide total dollars from your last bill by total kilowatt hours used.)	116
Energy Saving Fluorescents 28 4'35/34W RS 36 8'60W		<u> </u>	Please send the savings analysis to:  Name	
Deep Recessed Downlight Floods 44 75R30/FL			Company Address State	190
52 150R/FL Incandescent Bulbs 60 60 Watt			Zip CodePhone	_ 260
68 75 Watt 76 100 Watt			I buy lamps from:  Contractor	_ 290
PAR-Lamps 84 150PAR/FL 92 150PAR/SP 100 75PAR/FL			Distributor State State	
108 75PAR/SP			☐ Please have someone come out and help me fill out this form.	395

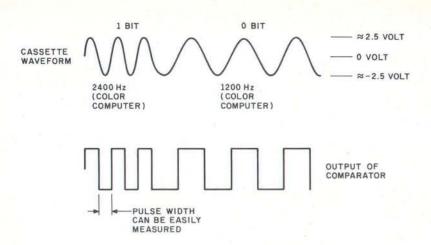


Figure 6: Both the Color Computer and Model III 1500-bps cassette logics use a "frequency-shift keying" recording technique in which two separate frequencies represent logic 0 and 1.

Listing 3: Sample Color Computer BASIC program for reading cassette input.

100 ' SWITCH CLOSURE FOR CASSETTE INPUT 110 A=(PEEK(&HFF20) AND 1) 120 IF A=0 THEN PRINT "OFF" ELSE PRINT "ON" 130 GOTO 110

Listing 4: Sample Model III BASIC program for reading cassette input.

100 ' SWITCH CLOSURE FOR CASSETTE INPUT 110 A=(INP(255) AND 1) 120 IF A=0 THEN PRINT "OFF" ELSE PRINT "ON" 130 GOTO 110

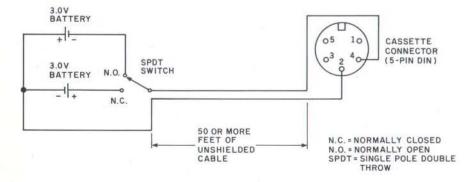


Figure 7: Remote sensing can be implemented in the Color Computer or Model III by connecting an SPDT switch to two 3-V batteries.

with about 2.5-V swings on either side of 0 V. When the cassette signal is positive, the "-" input is greater than +1 V, and the comparator output is logic 0. When the cassette signal is negative, the diode conducts, dropping the "-" input to below 0 V and forcing the comparator output to logic 1.

Output of the comparator goes to bit 0 of PIA address hexadecimal FF20 in the Color Computer or to bit 0 of input/output (I/O) port address hexadecimal FF in the Model III. Reading either port requires a single BASIC instruction (PEEK (&HFF20) or INP(255)) or a comparable machine-language instruction, Listing 3 provides a simple Color Computer BASIC test of the cassette-in bit: listing 4 shows the equivalent Model III test.

A remote sensing switch can be implemented in identical fashion to the RS-232C method, as shown in figure 7. Two batteries produce +3 V and -3 V, and these voltages are tied to the normally closed (NC) and normally open (NO) contacts of the remote sensing switch. The switch is connected via ordinary two-conductor cable. Again, twisted wires may be used if desired to improve noise immunity. A 60-foot length of cable was used in a home environment, and no false readings were detected for slow switch closures.

#### Switch Bounce

The BASIC programs listed for the three discrete input methods are fine for slowly changing inputs such as burglar alarms. A typical BASIC loop allows sampling at a dozen or so times per second. When the frequency of switch closures is greater, however, you must rely on faster assembly-language code. Assemblylanguage code can test the inputs thousands of times per second. In fact, assembly language is so fast that switch bounce can cause problems. The typical switches mentioned above do not close instantaneously. Minute movements produce "make and break" conditions during a certain period, as shown in figure 8.

Various hardware schemes can

# IF YOU BUY MICRO-COURIER BEFORE JULY 1, YOU GET A \$100 SUBSCRIPTION TO THE SOURCE FREE.

Micro-Courier is *the* electronic mail software for Apple™ computers. It lets you send anything in your Apple computer to any other Apple, in any other office, anywhere

in the world. It's fast, 100% error-free, and inexpensive. You can send and receive charts, graphs, VisiCalc™ reports and entire programs.

Micro-Courier also takes you right to THE SOURCE.

You can access one of the largest data bases in the world, including news, travel service, commodity updates, educational programs, electronic games and more.



SOURCE

And if you act now, you can get a free \$100 subscription to THE SOURCE with your Micro-Courier package.

See your Apple dealer for complete details.

MICROCOM.
We make little computers talk big.

MICROCOM

1400A Providence Highway Norwood, MA 02062

Apple is a trademark of Apple Computer Inc. VisiCalc is a trademark of VisiCorp., Inc. THE SOURCE is a servicemark of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc.

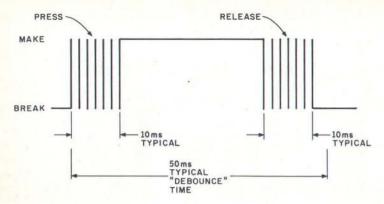
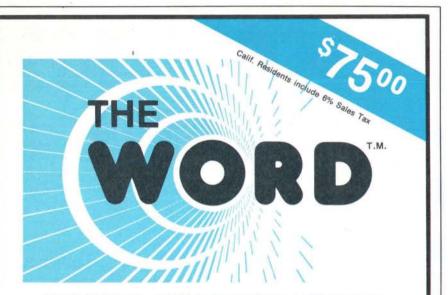


Figure 8: Switch debounce can be accomplished in software by delaying a "debounce time" after initial detection of the switch closure.



#### WHY DOES OUR SPELLING CHECKER COST LESS THAN THEIRS?

Maybe we goofed by not charging more for The WORD. Our customers tell us we must be crazy, giving away this much software for only \$75.

#### What's wrong with it?

Frankly, we're a little hurt when people ask us this question. We guess everyone must be getting used to paying \$200 to \$300 for decent software. Anything that costs less must be junk. Right?... WRONG!!!

The WORD is not only cheaper, it's better!

Available NOW for: 8" single CP/M, CDOSTM XEROX 820 (8" only) Intertec Superbrain<sup>TM</sup> AppleTM with CP/M Softcard (35.000 word dictionary) North Star<sup>TM</sup> Double/Quad with CP/M

CP/M is a registered trademark of Digital Research

#### OASIS SYSTEMS

2765 REYNARD WAY, SAN DIEGO, CA 92103

#### The WORD gives you more!

- The WORD gives you a 45,000 word dictionary that fits into less than 140K of disk space.
- The WORD works with your favorite text editor and marks mistakes in your document for easy, in-context, correction.
- The WORD's one-touch word review lets you add new words to the dictionary with a single keypress. You can build your own custom dictionaries too!
- The WORD will look up the correct spelling of misspelled words.
- The WORD analyzes your writing, counting words and showing you how often each word was used.
- The WORD has a special homonym helper feature to deal with these pesky words.
- The WORD will find rhyming words, solve crossword puzzles, and much more!

CALL TODAY! (714) 291-9489 eliminate switch bounce, but let's seek software solutions instead. The usual software approach is to delay for a fixed interval after detection of the first switch closure.

The following table suggests debounce requirements. The two Radio Shack switches referred to previously were pressed rapidly for exactly 10 closures within about 2 seconds for various "debounce delays" ranging from 10 ms to 100 ms. The "count" represents the number of switch closures detected. Counts greater than 10 indicate that switch bounces were counted as closures.

Debounce	Key Closures
Delay (ms)	Detected
100	10
90	10
80	10
70	10
60	10
50	17
40	19
30	22
20	33
10	59

The switch-bounce delay in software varies with the type of switch and action of the operator. Use these figures as a rough guide only.

#### A Low-Frequency Event Counter

Listing 5 gives a low-frequency counter program for the Color Computer, one that will measure events occurring thousands of times per second. The discrete input is on the cassette input line and is designed to interface to a BASIC driver.

Three parameters are stored in high memory in a 16K-byte system. The first, an interval count, is stored in locations hexadecimal 3FFA and 3FFB. The interval count may be any number from 1 through 32,768 and represents the time window during which events will be counted in units of 30.35 microseconds (us). An interval of 1000, for example, represents 30,350 µs or 30.35 ms. Maximum window time is 32,768  $\times$  30.35  $\mu$ s or .994508 second. (Note: for 32,768,

The second parameter, a debounce delay count in milliseconds, is stored in locations hexadecimal 3FFC and 3FFD. This delay count will cause the program to "close" the window for a

# The IBM Personal Computer

Personal, Professional, Technical — or somewhere in between ... PC-MATE™ makes the IBM Personal Computer a perfect match

PC-MATE<sup>TM</sup> from TECMAR is the first and only complete expansion series available for the IBM Personal Computer. There are currently more than twenty PC-MATE<sup>TM</sup> expansion options available, and new products are continuously added to the list.

When you want more from your IBM Personal Computer, look to PC-MATE\*\*.

You can create a SUPER PERSONAL COMPUTER with household lights and appliance control, voice output, and give it more memory than any ordinary personal can handle.

Or make it a PROFITABLE PROFESSIONAL SYSTEM with expansion space and a Winchester disk to handle more business accounts. Increase memory up to

the system limit and process those accounts faster. Add flexible I/O interfaces and put yourself on line to outside information sources.

As an INTELLIGENT LABORATORY TOOL with interfaces to IEEE 488 instrumentation, analog signals, stepper motors and video signals, your IBM Personal Computer becomes the perfect workbench assistant.

Hardware, Software, Accessories — PC-MATE<sup>10</sup> provides the highest quality and the greatest possible range of functionality for the IBM user.

Ask your local computer store for more information on the PC-MATE<sup>TM</sup> series from TECMAR, or call for the name of your nearest authorized PC-MATE<sup>TM</sup> dealer.

#### PC-MATE'M EXPANSION OPTIONS

Personal Computer Expansion Chassis (see photo) 192K and 256K Dynamic Memory with Parity Winchester Disk Drive and Controller Parallel Medium Speed Input/Output Interface Serial Medium Speed Input/Output Interface Parallel High Speed Input/Output Interface Serial High Speed Input/Output Interface Analog to Digital Converter - 8, 12, 14, 16 Bit Dust Cover Set for IBM PC and Peripherals High Speed Static Memory (RAM/ROM) Digital to Analog Converter - 8 and 12 Bit Multi-System Printer Sharing Facility CMOS Memory with Battery Backup System Clock with Battery Backup Electrically Erasable EPROM **BSR X-10 Device Controller** Stepping Motor Controller Video Image Digitizer **IEEE 488 Interface Prototyping Board** Music Synthesizer Voice Synthesizer Extender Board

One Year Warranty

Additional products are already under development, so if we don't have what you need, chances are good that we soon will.

Circle 408 on inquiry card.

Tecmar Inc Personal Computer Products Division

Listing 5: Color Computer assembly-language program for measuring low frequencies through the cassette input port. Switchdebounce time can be varied.

3F00			00120 00130 00140 00150 00160 00170	* LOW-FF * INPO * * * * OUTF ********	REQUENCY JT: \$031 UNI: \$031 \$031 PUT: \$031	EVENT CO FFA = INT TS, 2 BY FFC = DEB FFE = RES FFE = # (	**************************************
3F00	BE	3FFA		LOWERE	LDX	\$3FFA	GET INTERVAL CNT
	108E		00210		LDY	#0	INITIALIZE COUNT
3F07		1F		LOW010	LEAX	-1,X	DECREMENT INT CHT (5)
3F09	The state of the s	Self-chery	00230	LOMOTO			NOW IN D (7)
		10			TFR	X'D	
3FØB		an.	00240		TSTA	1 011000	TEST FOR NEGATIVE (2)
3FØC		ØD .	00250		BMI	LOM030	GO IF DONE (3)
3FØE		FF20	00260		LDA	\$FF20	GET PIA BYTE (5)
3F11		01	00270		ANDA	#1	GET CASSDIN BIT (2)
3F13		F2	00280		BEQ	LOM010	GO IF 0 (3)
3F15		21	00290		LEAY	1, Y	1, INCREMENT COUNT
3F17		97	99399		BSR	DEBNC	DEBOUNCE DELAY
3F19		EC	00310	1.011000	BRA	LOW010	CONTINUE INTERVAL
	10BF	SFFE		LOM030	STY	\$3FFE	STORE COUNT
3F1F	33		00330	also	RTS		RETURN FROM SUBROUTINE
			00340		JOE DELO	2 cumpour	TILIF
			00360		ACE DETH	Y SUBROUT	ITHE
3F20	24	10		DEBNC	PSHS	×	SAVE INTERVAL COUNT
3F22		3FFC	00380	DEDNO	LDX	\$3FFC	GET DELAY COUNT IN MS
3F25		06		DEB010	BSR	DELAY	DELAY N MS
3F27		1F	00400	DEDOIG	LEAX	-1,X	DECREMENT DELAY COUNT
3F29		FA	00410		BHE	DEB010	GO IF NOT N MS
3F2B		90	00420		PULS	X, PC	RETRIEVE INTERVAL COUNT, RTH
SPEP	3.0	20	00430		FULS	WILE	KEIRIEVE INTERVAL COONTARTA
					CLIDDOLLIT	THE DEL	AYS N MS.
			00450		SUBRUUT	THE " DELI	nio nino.
3F2D	24	10		DELAY	PSHS	×	SAVE DELAY COUNT
3F2F		006F	00470	DELITI	LDX	#111	FINAGLE FACTOR
3F32		1F		DEL010	LEAX	-1.X	DECREMENT FINAGLE COUNT
3F34	26	FC		DEFEIG		DEL010	LOOP FOR 1 MS
3F36			00490		BNE		
3F38		64	00500		LDX	4,S	GET INTERVAL COUNT
3F3B		88 DF	00510		LEAX	-33,X	ADJUST FOR 1 MS DELAY
		64	00520		STX	4/8	RESTORE IN STACK
3F3D	30	90	00530		PULS	X,PC	RETRIEVE COUNT, RTH
00000		0000	00540		END		
DEGRE	ווטו פ	AL ERRORS					

Listing 6: Model III assembly-language program for measuring low frequencies through the cassette input port. Switch-debounce time can be varied.

7FØØ	00100	ORG 7FØØH ;THIS SR NON-RELOCATABLE	E
	00110	**************************************	**
	00120	* LOW-FREQUENCY EVENT COUNTER WITH DEBOUNCE	*
	00130	* INPUT: 7FFAH = INTERVAL COUNT IN 26.86 MICROSEC	*
	00140	;* UNITS, 2 BYTES	*
	00150	** 7FFCH = DEBOUNCE DELAY CNT IN MS, 2 BYTES	*
	00160	<pre>;* 7FFEH = RESERVED FOR COUNT, 2 BYTES</pre>	*
	00170	<pre>;* OUTPUT: 7FFEH = # OF COUNTS IN INTERVAL, 2 BYTES</pre>	*
	00180	\$*************************************	**
	00190	;	
7FØØ F3	00191	LOWFRE DI ; DISABLE INTERRUPTS	

## TRS-80\* COMPUTING EDITION

©1981 Percom Data Co., Inc.

## The Percom Peripheral

35 cents

### Percom's DOUBLER II tolerates wide variations in media, drives

GARLAND, TEXAS — May 22, 1981 — Harold Mauch, president of Percom Data Company, announced here today that an improved version of the Company's innovative DOUBLER® adapter, a double-density plug-in module for TRS-80\* Model I computers, is

Reflecting design refinements based on both theoretical analyses and field testing, the DOUBLER II®, so named, permits even greater tolerance in variations among media and

drives than the previous design.

Like the original DOUBLER, the DOU-BLER II plugs into the drive controller IC socket of a TRS-80 Model I Expansion Interface and permits a user to run either single- or double-density diskettes on a Model I.

With a DOUBLER II installed, over four times more formatted data — as much as 364 Kbytes — can be stored on one side of a fiveinch diskette than can be stored using a standard Tandy Model I drive system.

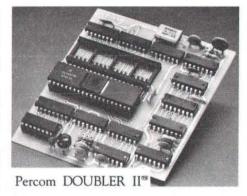
Moreover, a DOUBLER II equips a Model I with the hardware required to run Model III

(Ed. Note: See "OS-80": Bridging the TRS-80" software compatibility gap" elsewhere on this page.)

The critical clock-data separation circuitry of the DOUBLER II is a proprietary design called a ROM-programmed digital phase-lock

loop data separator.

According to Mauch, this design is more tolerant of differences from diskette to diskette and drive to drive, and also provides immunity to performance degradation caused by circuit component aging.



Mauch said "A DOUBLER II will operate just as reliably two years after it is installed as it will two days after installation."

The digital phase-lock loop also eliminates the need for trimmer adjustments typical of analog phase-lock loop circuits.

"You plug in a Percom DOUBLER II and

then forget it," he said.

The DOUBLER II also features a refined Write Precompensation circuit that more effectively minimizes the phenomena of bit-and peak-shifting, a reliability-impairing characteristic of magnetic data recording.

The DOUBLER II, which is fully software compatible with the previous DOUBLER, is supplied with DBLDOS\*, a TRSDOS\*-

compatible disk operating system.

The DOUBLER II sells for \$2,005, including the DBLDOS diskette.

The Percom DOUBLER II is available from authorized Percom retailers, or may be ordered direct from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty. Circle 333 on inquiry card.

#### All that glitters is not gold

#### OS-80<sup>(TR)</sup> Bridging the TRS-80\* software compatibility gap

Compatibility between TRS-80\* Model I diskettes and the new Model III is about as genuine as a goldplated lead Krugerrand.

True, Model I TRSDOS\* diskettes can be read on a Model III. But first they must be converted and re-

recorded for Model III operation.

And you cannot write to a Model I TRSDOS\* diskette. Not with a Model III. You cannot add a file. Delete a file. Or in any way modify a Model I TRSDOS diskette with a Model III computer.

Furthermore, your converted TRSDOS diskettes cannot be converted back for Model I operation.

TRSDOS is a one-way street. And there's no retreating. A point to consider before switching the company's payroll to your new Model III.

Real software compatibility should allow the direct, immediate interchangeability of Model I and Model III diskettes. No read-only limitations, no conversion/re-recording steps and no chance to be left high and dry with Model III diskettes that can't be run on a Model I.

What's the answer? The answer is Percom's OS-80m family of TRS-80 disk operating systems.

OS-80 programs allow direct, immediate interchangeability of Model I and Model III diskettes.

You can run Model I single-density diskettes on a Model III; install Percom's plug-in DOUBLER® adapter in your Model I, and you can run doubledensity Model III diskettes on a Model I.

There's no conversion, no re-recording. Slip an OS-80 diskette out of your Model I and in-

sert it directly in a Model III.

And vice-versa Just have the correct OS-80 disk operating system - OS-80, OS-80D or OS-80/III - in each com-

puter. Moreover, with OS-80 systems, you can add, de-lete, and update files. You can read *and write* diskettes regardless of the system of origin.

OS-80 is the original Percom TRS-80 DOS for BASIC programmers.

Even OS-80 utilities are written in BASIC.

OS-80 is the Percom system about which a user wrote, in Creative Computing magazine, "...the best \$30.00 you will ever spend.

Requiring only seven Kbytes of memory, OS-80 disk operating systems reside completely in RAM. There's no need to dedicate a drive exclusively for a system diskette.

And, unlike TRSDOS, you can work at the track sector level, defining and controlling data formats in BASIC — to create simple or complex data structures that execute more quickly than TRSDOS files.

The Percom OS-80 DOS supports single-density operation of the Model I computer — price is \$29.95; the OS-80D supports double-density operation tion of Model I computers equipped with a DOUB-LER or DOUBLER II; and, OS-80/III — for the Model III of course — supports both single- and double-density operation. OS-80D and OS-80/III each sell for \$49.95. Circle 334 on inquiry card.

#### Circuit misapplication causes diskette read, format problems. High resolution key to reliable data separation

GARLAND, TEXAS — The Percom SEPARATOR® does very well for the Radio Shack TRS-80° Model I computer what the Tandy disk controller does poorly at best: reliably separates clock and data signals during disk-read operations.

Unreliable data-clock separation causes format verification failures and repeated read retries.

#### CRC ERROR-TRACK LOCKED OUT

The problem is most severe on high-number (high-density) inner file tracks.

As reported earlier, the clock-data separa-tion problem was traced by Percom to misapplication of the internal separator of the 1771 drive controller IC used in the Model I.

The Percom Separator substitutes a highresolution digital data separator circuit, one which operates at 16 megahertz, for the lowresolution one-megahertz circuit of the Tandy design.

Separator circuits that operate at lower frequencies — for example, two- or fourmegahertz — were found by Percom to provide only marginally improved performance over the original Tandy circuit.

The Percom solution is a simple adapter that plugs into the drive controller of the Expansion Interface (EI).

Not a kit — some vendors supply an untested separator kit of resistors, ICs and other paraphernalia that may be installed by modifying the computer — the Percom SEPARATOR is a fully assembled, fully tested plug-in module.

Installation involves merely plugging the SEPARATOR into the Model I EI disk controller chip socket, and plugging the controller chip into a socket on the SEPARATOR.

The SEPARATOR, which sells for only \$29.95, may be purchased from authorized Percom retailers or ordered directly from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty. Circle 332 on inquiry card.

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

PRICES DO NOT INCLUDE HANDLING AND SHIPPING.

7F01 DD2AFA7F 7F05 01FFFF 7F08 FD210000 7F0C DD09 7F0E D21F7F 7F11 DBFF 7F13 E601 7F15 CA0C7F 7F18 FD23 7F1A CD257F 7F1D 18ED 7F1F FD22FE7F 7F23 FB 7F24 C9	00210 00220 00230 LOW010 00240 00250 00260 00270 00280 00290	LD LD ADD JP IN AND JP INC CALL JR LD EI RET	IX, (7FFAH) BC,-1 IY, Ø IX, BC NC, LOWØ9Ø A, (ØFFH) 1 Z, LOWØ1Ø IY DEBNC LOWØ1Ø (7FFEH), IY	GET INTERVAL COUNT FOR DECREMENTS INITIALIZE COUNT  DECREMENT INT CNT(15) GO IF DONE (10) GET I/O BYTE (11) GET CASSDIN BIT (7) GO IF 0 (10) INCREMENT COUNT DEBOUNCE DELAY CONTINUE INTERVAL STORE COUNT ENABLE INTERRUPTS RETURN FROM SR
7F25 FDE5	00360 DEBNC	PUSH	IY	SAVE INTERVAL CNT
7F27 FD2AFC7F 7F2B CD357F 7F2E FDØ9 7F3Ø 38F9 7F32 FDE1 7F34 C9	00370 00380 DEB010 00390 00400 00410 00420 00430 ;	LD CALL ADD JR POP RET	IY, (7FFCH) DELAY IY, BC C, DEBØ1Ø IY	;GET DEBOUNCE DELAY ;DELAY N MS ;DECREMENT DELAY CNT ;GO IF NOT N MS ;RETRIEVE INT COUNT ;RETURN FROM SR
		SUBROUT	INE. DELAYS N MS	
7F35 215E00 7F38 09 7F39 DA387F 7F3C 11DBFF 7F3F DD19 7F41 C9 0000	00460 DELAY 00470 DEL010 00480 00490 00500 00510 00520	LD ADD JP LD ADD RET END	HL,94 HL,BC C,DELØ1Ø DE,-37 IX,DE	;FINAGLE FACTOR ;DECREMENT FINAGLE CNT ;LOOP FOR 1 MS ;ADJUSTMENT CONSTANT ;ADJUST FOR 1 MS DELAY ;RETURN FROM SR

specified time after each pulse is detected. The number of events detected in the interval, the third parameter, is returned in locations hexadecimal 3FFE and 3FFF.

A similar program for the Model III is shown in listing 6. The three parameters are passed in locations hexadecimal 7FFA through 7FFF and represent the same variables. Because operation for the two programs is similar, I'll describe both in general terms.

The DELAY subroutine delays for 1 ms by a simple loop. An interval count is adjusted for the 1-ms delay in units of 30.35 or 26.86. The DEBNC surboutine gets the debounce delay parameter and calls DELAY to delay for the debounce time in units of 1 ms.

The "main-line" code is in

LOWFRE. The interval count parameter is decreased by 1 each time through the main loop. When the interval count is decremented beyond 0, the interval is completed, and the subroutine returns to the BASIC program. If the interval count is not completed, the PIA or I/O port bit for CASSDIN is read. If the cassette bit is a logic 1, the count of pulses is increased by 1, and the DEBNC subroutine is called for the debounce delay.

These programs detect a logic 1 pulse, i.e., a negative voltage input. The input signal can be any switch closure occurring up to thousands of times per second. A typical example is a roller switch on a rotating cam shaft. A longer time window can be created by repeatedly calling the subroutine.

BASIC drivers for both versions are shown in listings 7 and 8. The machine-language forms of the program are contained within the BASIC program in DATA statements, and the programs are poked into high random-access memory (RAM) by the BASIC code. The BASIC program asks for the interval and debounce delay parameters, pokes them into the parameter block, then calls the machine-language subroutine. A running total of all counts is printed after each call. To see how the program works, connect a switch as shown in figure 7, then close the switch for various delay and interval times.

#### Now For the Soft Breezes

To give you a practical example of what can be accomplished with a single discrete input, I'm going to





" ACCESSORIES	
Vic Datasette 6	35
Vic Disk Drive 48	39
Vic Graphic Printer 33	39
Vic 8K Mem. Expander	
Vic 16K Mem. Expander 17	
Vic RS 232C Interface	43
Vic IEEE-488 Interface	84
Game Paddles/Joysticks	19
Vic Super Expander	49
	44
Vic Mon Machine Language Monitor	44
Vic Modem 8	39
	69
PLENTY MORE IN STOCK	L
SOFTWARE	

	SO	FT	W	٩R	Ε					
Recreation Program	n Pac	k A	(Si	k Pa	ack)					 
Home Calculation I	rogra	am	Pac	k A	(Si	x F	ac	k)		 
Super Slot										 
Avengers										 
Super Alien										 
Super Lander										 
Draw Poker										 
ViCalc			oran e		energe o				***	 
ViTerm A										
ViCheck	encour.									
V.P.M										

### THE ALTERNATIVE SIC 108 ...

400214 1 01	702
SP9000 Super Pet	96
CBM 8032	39
CBM 8096	
CDIVI 0030	
	599
4040 Dual Disk Drive	
8050 Dual Disk Drive (1 meg)	139
8250 Dual Disk Drive (2 meg)	159
2031 Single Disk Drive	520
2001 Siligle Disk Diffe	140
8300P Letter Quality Printer	
	38
Pet-IEEE	33
COFTWARE	
SOFTWARE	
Word Pro 4 Plus	325
Wordcraft 80	289
	149
	329
	299
Dow Jones Portfolio	114
	229
	149
Croote A Does	
Create-A-Base	249
Create-A-Base AVAILABLE NOW ALL SOFTWARE	

<b></b>
CAPPIC II PLUS 48K
FOURTH DISK DRIVE
WITH CONTROLLER
WITH CONTROLLER
\$1758
₹ 1758 €
Junany Marie
The state of the s
Disk Drive/Controller (100% Compatable)
16K RAM Card (2 yr. Warranty)
AIO-II by SSM
CPS Multifunction Card by Mtn Comp
Metacard by Metamorphic
Keyboard Enhancer II by Videx
Microbuffer II by Practical Peripheral CALL 32K by Saturn (incl. software) 209
32K by Saturn (incl. software) 209 Parallel Board by CCS #7720A or 7720D 99 Lowercase for Apple 29
Numeric Keypad (23 key) by Keyboard
Sup R Mod
Z-80 Card by Microsoft
Videoterm by Videx

Signalman Modem
SOFTWARE
Bus. Pkgs by Continental199 ea.
DB Master by Stoneware 169
Desktop Plan by Visicorp
Home Money Minder by Continental CALL
Magic Window by Art-Sci
Peach Tree Accting Pkgs CALL
Personal Filing System 95
Screen Writer II (formerly Super Scribe II) 99
TASC by Microsoft
The Last One 449
Visifile
Visitile
Visicalc 189
Visidex 189
Visischedule
Visitrend/Visiplot
Entertainment
Alkemstone
Alkemstone
Apple Panic 24
Castle Wolfenstein 24
Gorgon
Olympia Decetholog

CP/M	
Basic 80	. 284
Basic Compiler	
Calcstar	
Mailmerge	
Spellstar	
T/Maker	. 229

CALL FOR COMPLETE SELECTION
\*APPLE IS A REGISTERED TRADEMARK

WE HAVE IT ALL . . . JUST CALL IF YOU DON'T SEE IT!

**EPSON** MX-70 **MX-80G** MX-80 F/T

MX-100

SPECIAL MONTH ONLY

**IDS PRISM** 

NEW	
Modem	79
wicrosoft Soficaro Premium Sys	95
RGB Card for Amdek II	159

Visidex			ar anal anal anal an		189
Visischedule					189
Visitrend/Visiplot	cores.			0.0000000000000000000000000000000000000	199
Ent	terta	inm	ent		
Alkemstone					34
Apple Panic					24
Castle Wolfenstein					
Gorgon					35
Olympic Decathalon					24
Time Zone					79
Softporn			*******	enements.	29
Complete Selection	in St	ock			CALL
V.	CP	/M			

Dasic ou																								
Basic Com	p	ń	le	31																	٠		299	
Calcstar	ï								 														166	
Mailmerge																			1	i.			79	
Spellstar																								
T/Maker									 									Ċ.					229	
Movdotor																							220	

Δ.	CCESS	ORIES	
TecMate Expansion			
Time Master by Ter	c Mar	********	89
Device Master by T	ec Mar		199
IEEE-488 Interface	by Tec Mar		355
64K by C.I			499
128K by C.I			
256K by C.I			790
Apparat Inc			CALL
And present the second	SOFTW		
	SOLIM	ANE	
CP/M - 80			
Temple of Apshai .			29
Home Accting Plus			
Mathe Magic			75
Visicalc (256K)			
Visicalc (Stndrd)			175

SAVES SAVES **CALL FOR SELECTION!** 



	edge I/O m.board									
	ar for NE									
Super (	Calc for N	VEC					 			2
NEC W	ordproce	ssing &	Accting	Soft	war	e.	 ++		C	AL

AIAK													
Atari 400 W/16K (M	em.	Ex	par	ide	rs	A	va	1.	١.		٠.		319
410 Recorder													
810 Disk Drive													449
825 80 Col Dot Mate	rix .												699
850 Interface													159
Ramcram													
Ram Disk													

### FREE CATALOGUE -800-854-2833

### **HOW TO ORDER**

Ordering information: Phone orders using VISA, MASTER-CARD, AMERICAN EXPRESS, DINER'S CLUB, CARTE BLANCHE, bank wire transfer, cashier's or certified check, BLANCHE, bank wire transfer, cashier's or certified check, money order, or personal check (allow ten days to clear). Unless prepaid with cash, please add 5% for shipping, handling and insurance, (minimum 5.00) California residents add 6% sales tax. We accept CODs, OEM's. Institutions and corporations please send for a written quotation. All equipment is subject to price change and availability without notice. All equipment is new and complete with manufacturer's warranty (usually 90 days). Showroom prices may differ from mail order prices.



(714) 579-0330 **MAIL TO: 1251 BROADWAY EL CAJON, CA. 92021** 

Listing 7: Color Computer BASIC driver program for LOWFRE. The machine-language code is included in the program and poked into high memory.

```
100 ' LOWFRE DRIVER
110 DATA 190,63,250,16,142,0,0,48,31,31
   DATA 16,77,43,13,182,255,32,132,1,39
130 DATA 242,49,33,141,7,32,236,16,191,63
140 DATA 254,57,52,16,190,63,252,141,6,48
150 DATA 31,38,250,53,144,52,16,142,0,111
160 DATA 48,31,38,252,174,100,48,136,223,175
170 DATA 100,53,144
180 FOR I=&H3F00 TO &H3F3E
190 READ A: POKE I, A
200 NEXT I
210 DEFUSR0=%H3F00
220 INPUT "INTERVAL, DELAY"; IC, DC
230 POKE &H3FFA, INT(IC/256):POKE &H3FFB, IC-INT(IC/256)*256
240 POKE &H3FFC, INT(DC/256):POKE &H3FFD, DC-INT(DC/256)*256
250 A=USR0(0)
260 B=B+PEEK(&H3FFE)*256+PEEK(&H3FFF):PRINT B
270 GOTO 250
```

**Listing 8:** Model III BASIC driver program for LOWFRE. The machine-language code is included in the program and poked into high memory.

```
100 ' LOWFRE DRIVER
110 DATA 243,221,42,250,127,1,255,255,253,33
120 DATA 0,0,221,9,210,31,127,219,255,230
130 DATA 1,202,12,127,253,35,205,37,127,24
140 DATA 237,253,34,254,127,251,201,253,229,253
150 DATA 42,252,127,205,53,127,253,9,56,249
160 DATA 253, 225, 201, 33, 94, 0, 9, 218, 56, 127
170 DATA 17,219,255,221,25,201
18Ø FOR I=32512 TO 32577
190 READ A: POKE I:A
200 NEXT I
210 DEFUSRO=&H7F00
220 INPUT "INTERVAL, DELAY"; IC, DC
230 POKE &H7FFA, IC-INT(IC/256)*256:POKE &H7FFB, INT(IC/256)
240 POKE &H7FFC,DC-INT(DC/256)*256:POKE &H7FFD,INT(DC/256)
250 A=USR0(0)
260 B=B+PEEK(&H7FFE)+PEEK(&H7FFF)*256: PRINT B
270 GOTO 250
```

describe a plumbing/electronics project—an anemometer. All parts can be purchased at your local hardware store and Radio Shack. The anemometer will measure a wide range of wind speeds and is easy to construct. Best of all, the entire project costs less than \$10.

The plumbing. The physical appearance of the anemometer is detailed in figure 9. It's constructed with common 1-inch and ½-inch poly vinyl chloride (PVC) sprinkler fit-

tings, wooden dowels, and plastic cups. Necessary parts are listed in table 1. To asemble the unit, refer to figure 10 and proceed as outlined in steps 1 through 19.

- Cut a piece of 1-inch PVC thickwall tubing to a length of 4 inches. (Any saw will do, but a hacksaw is best.)
- 2. Drill a hole in a 1-inch cap just large enough to pass a ½-inch PVC tube without friction.
- Cement the cap to the 4-inch piece of tubing from step 1. Push

the cap firmly down on the tube.

- Drill a ¾<sub>16</sub>-inch hole completely through the cap abut ½-inch up from the bottom of the cap.
- 5. File off any projections from the bottom of a ½-inch cap.
- Drill a small, centered hole in the cap and push in a decorative nail having a rounded head. It should fit snugly.
- Cement the cap to a 6-inch piece of thin-wall ½-inch PVC tubing.
- Push the ½-inch tubing from step
   through the hole in the 1-inch

Associated States and foreign Cool States and foreign

Author's Name

# AS AN AUTHOR MICHIGANISMS AND THIS MIGHT BE YOUR MOST IMPORTANT LINE.

If you've tried to market your own program, you've probably run into a virtual brick wall of problems. Problems that require time, energy, funds, personnel and expertise to solve.

Lifeboat Associates invites you to bring your problems to us. That way you can do what you do best: create quality software. And we can do what we

do best: sell it.

As an international publisher of quality computer software with a strong relationship among business, professional, programming and personal computer users, as well as micro- and minicomputer OEM's, Lifeboat Associates has sold and fully supported more software programs by more authors for more machines to more users in more countries than anyone else.

And we do a lot more than sell. Lifeboat

also provides:

• Full after sales support • A multitude of media formats • OEM sales • Extensive promotional campaigns through Lifeboat's Software Desk Reference™, specially designed OEM private label catalogs, foreign catalogs, brochures, flyers and direct mail • Advertising • Advertising preparation • Marketing services throughout a wide network of affiliates, dealers and distributors • Translation facilities into foreign languages • Seminars • Typesetting services • And lots more

So if you've expended your time and genius in writing a great program, bring it to Lifeboat. We'll expend our time and genius in publishing it.

Write for a copy of the Lifeboat Author Guide.

# Lifeboat Associates World's foremost software source

1651 Third Avenue, New York, New York 10028

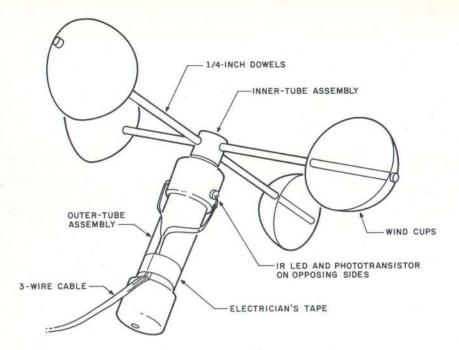


Figure 9: A working anemometer can be easily constructed by using common materials (and a \$600 or \$1000 computer).

Quantity	Description
1	4-inch piece of 1-inch PVC thick-wall tubing
2	1-inch slip caps
2	1/2-inch slip caps
1	6-inch piece of 1/2-inch thin-wall tubing
1	round-head nail or small screw
3 ft	1/4-inch wooden doweling
4	plastic, low-mass cups (halves of plastic ball or toy)
1	container of PVC cement
1	suitable mounting hardware for mast

Table 1: Anemometer parts list.

cap. Now cement a second 1-inch cap over the 1-inch tube. (Put two 1/8-inch drain holes in the bottom of the second cap.) Do not push the cap on all the way. The inner 1/2-inch tube should move as freely as possible.

9. After the cement has dried for an hour, drill a 3/16-inch hole through the inner tube, using the existing hole as a guide. Hold the tubes up to the light. The holes in the tubes should match. If not, drill out the inner tube again.

10. Drill two 1/4-inch holes completely through a 1/2-inch cap. The holes should be at right angles to each other and as close to the top of the cap as possible. The bottom hole should clear the path of the top hole.

11. Cut two 1/4-inch wood dowels to 14 inches. Push through the holes in the cap. Center the dowels.

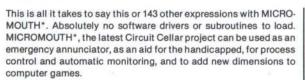
12. Cement the dowels if they don't fit tightly.

13. Mount four plastic half-spheres (cups) on the four dowels. All four should present the same face to the wind.

14. Align and cement the plastic cups.

15. After the cement has dried, temporarily mount the cup assembly on the inner tube. Cut off enough of the inner tube to that the bot-





Sample phrases that can be programmed are:

'THE TIME IS 4 HOURS 23 MINUTES . . . (BEEP)"

"NUMBER 4 IS 3.47 VOLTS

"THE SPEED IS 100 METERS A SECOND . . SLOW DOWN" Thousands of expressions can be added by changing the ROM chips.

MICROMOUTH\* is plug compatible with APPLE II and TRS-80\* computers. Directions are included for \$100, H8 and parallel port operation. \*DIGITALKER is a trademark of National Semiconductor Corp.

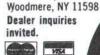
Complete Kit (as shown) \$120.00 Assembled and tested:

Apple II.....\$150.00 TRS-80 Model I w/power

supply and cable.....\$170.00 TRS-80 Model III.....\$200.00

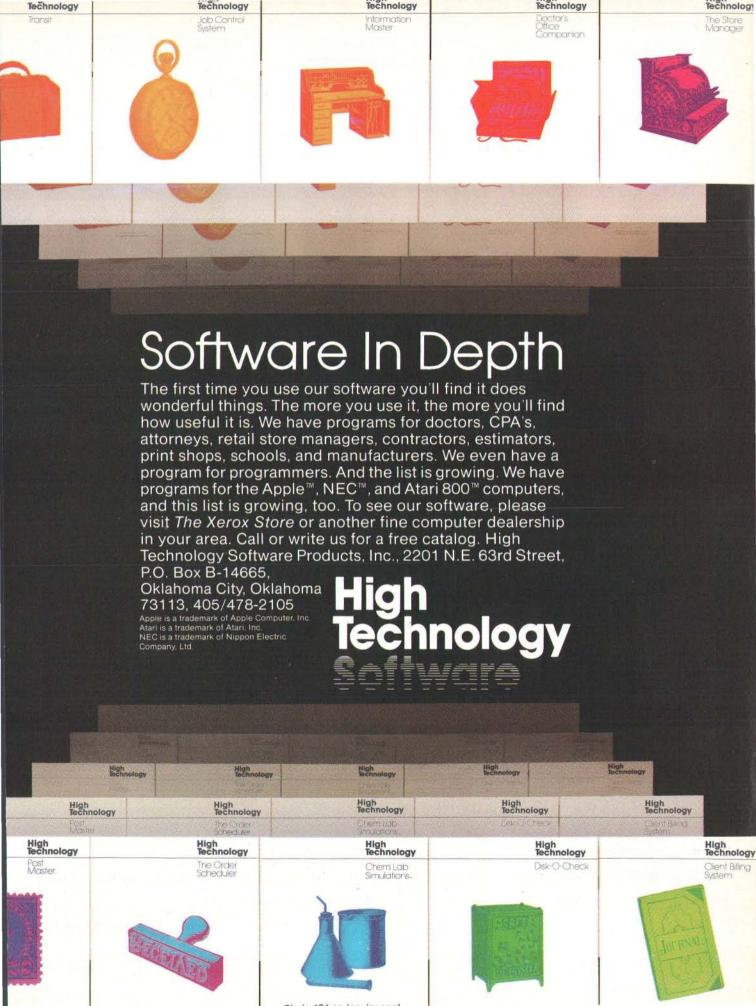
call: 1-800-645-3479 In N. Y. 516-374-6793

\*MICROMOUTH is a trademark of Micromint Inc The MicroMint Inc. 917 Midway











## **ORANGE MICRO JUST TURNED** A PAGE HISTORY.

### **OUR PRICES, SELECTION &** SAME-DAY SHIPPING MAKE US COMPETITIVE...

Outstanding Graphics, Print Quality & Performance



144 x 160 dots/inch · Proportional Spacing

- Lower case descenders
  Nx9 dot matrix
  8 character sizes
  5 unique alphabets
- Greek character set . Graphic symbols
- · 100 CPS print speed · Bi-directional logicseeking • Adjustable tractors • Single-sheet friction feed • Vertical & horizontal tabbing

**NEC 8023** Dot Matrix

..... List \$795

### **IDS Paper Tiger** 560/Prism 80/132

Affordable Color, Speed



Dot Resolution Graphics • 9-wire staggered printhead • Lowercase decenders • Over 150 CPS • Bi-directional logic-seeking • 8 character sizes • 80-132 columns

- · Hi-res dot graphics · Proportional spacing

 Text justifications List \$899 ...List \$1395 IDS Paper Tiger 560G Prism 132 (Color) ... List \$1995 \$1895

### **NEC Spinwriter** 7700 & 3500

Daisy Wheel Quality Leader



High speed, letter quality • 55/33 CPS
• Typewriter quality • Bi-directional plotting & proportional spacing . Quiet . OCR quality print • Hi-res plotting/graphing • Quick change ribbon • Optional cut-sheet feeder, horizontal or bidirectional tractors • Prints up to 8 copies.

NEC Spinwriter RO Serial Parallel 77xx List \$3055 \$2575 35vv List \$2290 \$1975

### The Epson Series. High-Quality Printers at a Low Price.



### Epson MX70

Super low priced dot resolution graphics

- 5 x 7 dot matrix User replacable printhead
   Top of form 80 CPS optional friction feed
- 10" paper width

Epson MX70 ..... List \$450



### Epson MX80/MX80FT

- 9 x 9 dot matrix Lower case decenders 80 CPS Bi-directional Logic seeking 40, 66, 132, columns per line 64 special graphic characters; TRS-80 Compatible Forms handling Multipage printing Adjustable tractors

Epson MX80 ..... List \$645

Epson MX80FT ..... List \$745



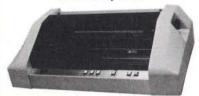
### Epson MX100

Same basic features as the MX80 • Plus friction feed for single sheets • Plus 15" wide carriage • Dot Resolution Graphics MX100 ...... List \$995

Full Line of Epson Accessories

### Anadex 9501

High Speed, Commerical Duty Plus Graphics



Dot graphics . Wide carriage . 11 x 9 dot matrix • Lower case descender • Dot resolution graphics • Bi-directional, logic seeking • Up to 200 CPS • RS 232 Serial & Parallel • Forms control • X-On/X-Off • Up to

Anadex 9501 ..... List \$1650 \$1350

### INTERFACE EQUIPMENT

Complete stock of options, cables and accessories. GRAPPLER APPLE INTERFACE \$175 CCS APPLE SERIAL Interface & Cable . . . . . . . . . . . . . \$150 ORANGE INTERFACE for Apple II
Parallel Interface Board and Cable NOVATION D-CAT direct connect modem . . . . . . . . . . . \$180 COMPLETE STOCK OF EPSON ACCESSORIES ..... \$Call CUSTOM PRINTER CABLES FOR Apple, Atari, IBM, TRS-80 (all models) ...... SCall HAYES MICROMODEM .....\$300 PRINTER STANDS: Large ..... \$99 PRINTER RIBBONS—Most Types ..... \$Call



### OUR PEOPLE MAKE US EXPERTS.

### Malibu 200 **Dot Matrix & Letter Quality** in One Printer



200 CPS standard • Letter quality font • 12 optional fonts • Bi-directional logic seeking • 19 x 18 dot matrix • Expanded characters (2x, 4x) Optional • Dot resolution graphics of 144 x 120 • Underlining

Malibu 200 . . . . . List \$2995 \$20U

### Okidata 82A Hi-Res & TRS-80 Block Graphics



120 CPS . Bi-directional printing . Logic seeking . Double width & condensed printing Friction & tractor feed standard
 Font selection, character pitch & line spacing are program controllable

Okidata 82A.....List \$799

### Centronics 739 Crisp Dot-Matrix Characters



Graphics & word processing print quality

N x 9 dot matrix • suitable for word processing • Underlining • Proportional spacing • Right margin justification • Serif typeface • 80/100 CPS • 9½" pin feed/friction Optional 2 Color Kit

Centronics 739-1 . . . . List \$695

Centronics 739-3 . . . . List \$795

### Our People, Our Product: Both Are Specialized.

Because our salespeople are printer specialists, they know the capabilities of each printer—and how to match one to your exact need. Red Baron's volume stocking assures a low, low price on a wide array of major brands. We're sure you'll like the product and services you get from Red Baron, and we know you'll love our Customer Benefit Package; an exclusive at Red Baron.



Customer Benefit Package

1. Free Expert Consultation. Before you buy, after you buy. 2. Toll-Free Ordering. There's never a toll charge when you place your order at Red Baron. 3. Free Catalog. Get your informative catalog with printer comparison chart and character samples today! 4. Warranty. The manufacturer's warranty applies where applicable. 5. Same-Day Shipping. Your order is sent the same day when you call before 11:00 a.m. 6. Free/MasterCard & Visa. Call us toll-free and charge your printer to your credit card. 7. We Stock What We Sell. No bait and switch, no hassle. We make every effort to keep a large stock of our advertised products.

### Televideo CRT's Price, Performance & Reliability



910C . . . . . List \$699 \$600 920C . . . . . List \$995 \$770 925C . . . . List \$995 \$750 \$970 950 . . . . List \$1195

### Here's how to order.

Phone orders are welcome; same-day shipment on orders placed before 11:00 a.m. Free use of Master-Card and Visa. CODs accepted. Personal checks require 2 weeks clearance. Manufacturer's warranty included on all equipment. Prices subject to revision.



CALL FOR FREE CATALOG

### **Orange Micro Retail Stores**

Sherman Oaks: 13604 Ventura Blvd. (213) 501-3486 Anaheim: 3150 La Palma, # I (714) 630-3622 Santa Clara: 3216 Scott Blvd. (408) 980-1213

Circle 312 on inquiry card.





COMPUTER PRODUCTS

1100 N. TUSTIN ANAHEIM, CA 92806

TOLL FREE

1-800-854-8275 (714) 630-3322

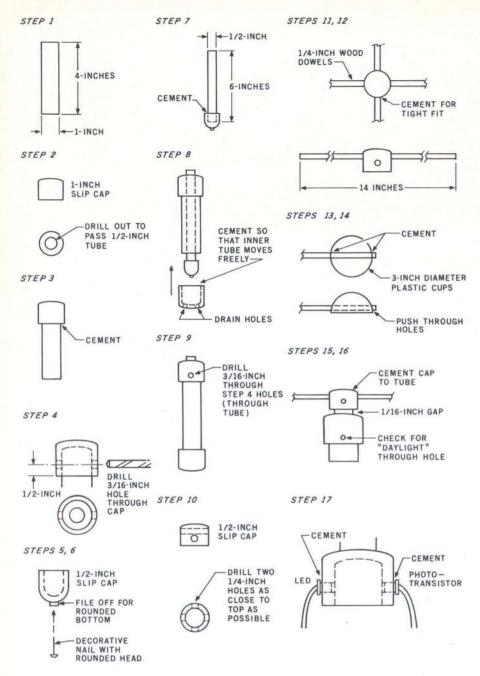


Figure 10: Construction details of the anemometer. Total construction time is approximately one hour if all parts are on hand.

Quantity	Description	
1	150-ohm 1/4-watt 10% tolerance resistor	
1	1-kilohm 1/4-watt 10% tolerance resistor	
1	100-kilohm 1/4-watt 10% tolerance resistor	
1	4.7-kilohm 1/4-watt 10% tolerance resistor	
1	560-ohm 1/4-watt 10% tolerance resistor	
1	741C op-amp (Radio Shack 276-007)	
1	Infrared LED (Radio Shack XC880-A, 276-143)	
1 -	Infrared phototransistor (Radio Shack 276-145)	
2	6-V batteries or 8 "C" cells in assembly	
1	Wire, cable, solder	
1	Project board (Radio Shack 276-175)	
1	DIN plug, 5-pin (Radio Shack 274-003)	

- tom of the inner tube cap is about  $\frac{1}{16}$  inch from the top of the 1-inch cap. Cement the cup assembly to the inner tube.
- Again, check the hole alignment of the inner and outer tubes. Redrill the inner tube if necessary.
- 17. Press-fit the phototransistor and light-emitting diode (LED) into the two holes. Bring down the two leads from each. Cement the components in place using a bead of PVC cement around the edges.
- 19. Spin the cup assembly. It should move very freely, even in a light wind. You should be able to spin it by gently blowing at a cup at a distance of about a foot.

The electronics. The electronics assembly is built on a Radio Shack project board. The arrangement of the parts is shown in figure 11, and a parts list is given in table 2. Make a cable assembly of four wires and route to the anemometer. Solder the four cable wires to the LED and phototransistor as shown in figure 12.

After soldering the cable wires, wrap a piece of plastic electrical tape around the cable and tubing for strain relief. Put a dab of PVC cement on each solder joint and exposed lead. This will waterproof the connections.

The circuit for the electronics is shown in figure 13. The electronics produce a +6-V or -6-V signal to the cassette input line. The 741C operational amplifier (op-amp) compares a voltage at the "—" input that is about 82 percent of the positive supply voltage. If the input voltage on the "+" lead drops below this level, the output of the op-amp is -6 V; otherwise it is +6 V.

When the two holes in the anemometer tubing are aligned, the infared light from the LED strikes the phototransistor and causes current to flow through it. When enough current flows, the "+" input drops below the 82 percent level and the opamp output drops to -6 V. When no light is striking the phototransistor, no current flows through it, the "+" input is +6 V, and the op-amp output is +6 V. Place the anemometer assembly in a location that's shady yet exposed to the wind. (Don't

# BOARDS COMPATIBLE

ZOBEX

256K MEMORY WITH PARITY

Limited time only! \$598

HARD DISC SUBSYSTEM FOR IBM AND S-100

HA62

IBM BUS HARD DISK INTERFACE FOR WD-1000

4SP PB

4 SERIAL PORTS FOR IBM

FB

PROTOTYPING BOARD FOR IBM EXTENDER BOARD FOR IBM

### S-100 BOARDS

ZOBEX CPU

Z-80A CPU WITH 4 SERIAL AND 3 PARALLEL PORTS

ZOBEX DDFDC

DOUBLE DENSITY DISK CONTROLLER

ZMS-100

64K RAM

HDCI

S-100 HARD DISK INTERFACE FOR WD-1000

### ZOBEX

7343 J. RONSON RD. SAN DIEGO, CA. 92111 (714) 571-6971

**ZOBEX** is trademark of **ZOBEX** CORPORATION IBM is trademark of International Business Machines Corporation

# **BRAINS-MAINFRAMES**

### **SUPERBRAINS**



### **SUPERBRAIN QD 64K**

List \$3995 . . . . only \$2949

Z-89 48K List \$2895 . . . . only \$2099 Z-90 64K DD 3195 ONLY \$2489

### COMPUSTARS

Available to Dealers

### **NORTH STAR**

Minicomputer Performance

Green Phosphor Options: Graphics + CP/M

List ......\$3999 Only .....\$3199

### **ADVANTAGE**



ZENITH

Monitor Green Phosphor \$118

TERMINALS Z-19	\$718
INTERTUBE III Super Smart	\$710

### **EPSON**

MX-80 F	7						\$598
MX-80.							\$474
MX-100							\$749



ANADEX 9501									
<b>NEC Letter Qual Friction &amp; Tractor</b>	r.								call
ZENITH printer Z-25 list 1595 only									\$1256
STARWRITER letter qual FT									\$1824
and the permanental comment of the property of the permanent of the permanent of									18.000

ATARI

ATARI 400	 List \$399	only \$340
800	 List \$899	only \$675

Wonderful Games-Education for your family

Main Frames - S										
Single Board Co	ompute	er 64K					 	 	 \$7	49
6800-CPU S-10										

AMERICAN SQUARE COMPUTERS is organizing a World Wide Association of Computer Dealers. Open a Store or Start Work Out of Your Home! We Charge NO FRANCHISE FEE! (Our Competitors charge a FRANCHISE FEE of from \$15,000.00 to \$45,000.00.) Be a Winner! Let US help YOU get started MAKING MONEY by HELPING PEOPLE to put COMPUTERS to WORK. Write or Phone today.

### **GODBOUT COMPUPRO**

Super Sixteen 8085/8088 is the fastest combo 8/16 CPU LIST ...... \$3904 ...... Special \$3269

### SEATTLE'S

16 bit COMPUTER is here! 8 MHz 8086 CPU the fastest S-100 computer! 128K Static RAM, DD Disk Controller, 22-slot Main Frame, 86-DOS, #2 128K

LIST ...... \$4185 ...... ONLY \$3349 #1 As above but 64K LIST ... \$3190 ... ONLY 2649

### **CALIFORNIA COMPUTER 2210A**

### SYSTEMS GROUP SYSTEM 2800

Runs CP/M or OASIS. Supports single user & multiuser & multi task. Up to 5 megabytes with 8" drives. Optional 10-megabyte hard disk.Optional tape back up #2812 \$5035......ONLY \$3775

### TARBELL'S

Empire I&II have two 8" disk drives. The I is single sided, the II is double sided.

**FREE Business Software** 

Empire I LIST \$4888 . . . . . . . Only . . . . . . \$3666

We sell The Finest Hardware

919-889-4577

**AMERICAN** 

4167 Kivett Dr.



We sell The Finest Software

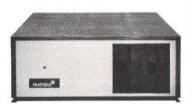
**COMPUTERS** 

Jamestown, NC 27282

919-883-1105

# LOWEST PRICE-BEST QUALITY

### **NORTH STAR Horizon 2**



2-5¼" Disk Drives 64K Double Density Factory assem. & tested Factory guaranteed

A few left Low Price only

\$2499

### Powerful North Star BASIC Free Superb for Business & Science

HORIZON STANDARD IS NOW HRZ-2-64K QUAD

Factory Assembled & Tested	List		Only
Horizon-2-32K-Double Density			\$2349
Horizon-2-32K-Quad Density			\$2549
Horizon-2-64K-Quad \$3	599		\$2699
Horizon-2-64K-QHD 5			
Horizon Ram ASM32K=\$		0.0000000000000000000000000000000000000	(=\$524
Big Sale on Multi-User Time-Sharing			call
English to Basic Translator			\$99
North Star Hard Disk 18 Mb \$5	375		
North Star Time Sharing Multi-User			call
	350		call
Secretary Word Processor	-		\$99
Wordstar Word Processor			\$318
	399		\$319
	VE		call
	230		\$220
	VE		call
Ecosoft Accounting \$355 MICROST			\$265
			\$515
Extra Precision Basic			\$50
	199		\$179
	299		\$224
	399		\$349
			\$429
	499		\$429
	499		\$429
	499		\$429
	499		\$429
	499		\$1274
DOS + Basic 5.2	.00		27

### **DECISION I**



"The IBM-360 on the Z-80 & S-100 BUS!"

Sixteen Programs running simultaneously! Free CPM, Microsoft BASIC and WORDSTAR with Complete system!

Systems	LIST	ONLY
DECISION 1 + 65K Static + 8" Disks	\$4375	3500
DECISION 1 + 65K Static + 2 - 5" Disks	4195	3356
DECISION 1 + 65K Static + 5" Disk + 5 Mb Hard Disk	5990	4792
DECISION 1 3 user 195K Static + 5" Disk + 5Mb Hard Disk + MICRONIX	8035	6428
DECISION 1 — Z-80 + 1/0=Power	1725	1339

### MORROW 8" Disk

Discus 2D + CP/M 600K only \$849 Discus 2 + 2 + CP/M 1.2 MEGA B. \$1149 Add Drives 2D = \$599 2 + 2 = \$795 Discus 2D-dual + CP/M Only \$1388 Free Microsoft BASIC from MORROW with Discus system or hard disk



M-26 MORROW Hard Disk 26,000,000 Bytes!! List \$4495 ....... Only \$3395 Free CPM + BASIC M-20 List \$4795 .. Only \$3835 M-10 List \$3695 .. Only \$2955 M-5 List \$2495 .. Only \$1995

### **InterSystems**

Z-80A CPU 4 MHz 64K Dynamic RAM Front Panel

VI/0-1 - with interrupts FDCII Disk Controller 20 slot motherboard

List \$3795 ..... Only \$2839

Without front panel as above only \$2716 Front Paneless Recommended for Business

### Save on Memory and Programs

Systems Memory 64K A&T .... \$459 Systems Memory 64K Bank .... \$555 Microangelo ..... \$985 Corvus Hard Disk..... SAVE SSM Video BRD VB3 kit ....\$361 Spectrum Color ASM ....\$326 Cat Novation Modem ...... \$169 Memory Merchant 16K ..... \$159 Which Computers are Best?—FREE. Insured Shipping at Low Rates. Call For Latest Prices, Details. We Beat Advertised Prices.

**Factory Guarantees** 



SQUARE

**COMPUTERS** 

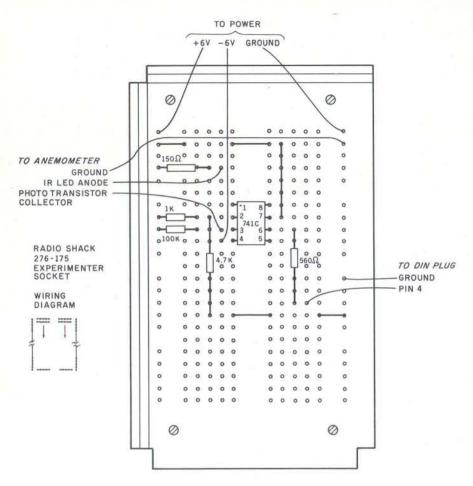
919-889-4577

4167 Kivett Dr.

Jamestown N.C. 27282

919-883-1105

**Expert Advice** 



**Figure 11:** The electronics portion of the anemometer uses a small project board for easy circuit assembly. Three sets of wires go to power connections, the anemometer, and the cassette input plug.

mount it on a 200-foot tower until after additional testing, however.)

A PERIOD program. Listings 9 and 10 show PERIOD programs for the Color Computer and Model III, respectively. The PERIOD programs are used with the anemometer, but they are also general-purpose programs for measuring the period of any input signal that does not have to be debounced. The period is measured from the first negativegoing transition to the next negativegoing transition in 20.23- or 24.33-µs units. The period is passed back to a BASIC driver in locations hexadecimal 3FFE and 3FFF (Color Computer) or as the value of the USR function (Model III).

Listings 11 and 12 show the PERIOD programs incorporated as DATA statements in BASIC drivers. The machine-language code is located in high memory in both cases.

Using the anemometer. Protect high memory in the Color Computer by a CLEAR 200, &H3EFF. Protect high memory in the Model III by inputting a MEMORY SIZE of 32511. Load the BASIC Anemometer program, connect the cassette input to the electronics, connect the electronics power, and run the program.

The program measures the period for the rotating anemometer. If no



## More Apple II owners choose Hayes Micromodem II than any other modem in the world.

Compare these features before you buy.

You should. It's your money.
Thousands of Apple II owners
have already compared, considered, and now they are
communicating — with
Micromodem II. The best
modem for your
Apple II. The most
modem for your

money!
A complete
data communication system for

the Apple II. The Micromodem II is not "base priced" plus necessary "options." It's a complete, high-performance system, designed specifically for your Apple II and ready immediately to put you in communication with all of North America.

Unexcelled receive sensitivity level. Receive sensitivity levels determine the range of error in data transmission.

Micromodem II's excellent receive sensitivity level promises you clearer, more accurate transmission.

Auto-dial and answer features built in. Automatically dials the telephone.

answers the telephone, receives and transmits and hangs up the telephone – completely unattended. You can take advantage of low evening and week-end telephone line rates.

Operation can be full or half-duplex. And with user selectable transmission rates of 110 or 300 bps. FCC approved and completely Bell 103 compatible.

Quick and easy installation. The Micromodem II plugs directly into the Apple II, eliminating the need for a serial interface card. And the Microcoupler<sup>1M</sup> (included) connects the Apple II directly to a standard RJ11 modular telephone jack, eliminating the losses and distortions associated with acoustic couplers.

Plus a wide variety of software, available right now! Because of our position in the industry, numerous sources have developed software specifically for the Micromodem II. The versatility of these prepared programs gives you a distinct advantage as an Apple II owner. Available in computer stores nationwide.

So if you're ready to communicate with other computers... or to access large time-sharing systems like THE SOURCE\*, AMERICA'S INFORMATION UTILITY\*, then you're ready for Micromodem II. Come on. Compare. Consider. And you'll discover the time is ripe to join the thousands of happy Apple II owners who are communicating with Micromodem II's complete system capability.

Available at computer stores all across America – call or write for the

Hayes

location nearest you. And don't settle for anything less than Hayes.

Hayes Microcomputer Products, Inc. 5835 Peachtree Corners East, Norcross, Georgia 30092 (404)449-8791

Your Apple II just isn't the same without a Hayes Micromodem II.

# Build your own private library for less than \$20 a month!

Each volume bound in genuine leather and fine fabric . . . the leather embellished with 22 karat gold.

Imagine being able to glance up at your bookshelf, and see there your own private library. With its proud expanse of leather spines, richly ornamented in gold, bearing the titles of the greatest books ever written.

Here, clearly, would be something of permanence in a changing and uncertain world. Something to treasure now . . . and to pass along to future generations in years to come.

A treasure, indeed, you might think—but surely an expensive luxury. Far from it.

For this is The Heirloom Library of the World's Greatest Books. Fifty enduring works of genius, selected by a distinguished board of advisers. In the handsome Collector's Edition, crafted for posterity in bindings of leather and fine fabrics. Ornamented with exclusive designs, the spines embellished with 22 karat gold.

Beautiful books, at a guaranteed low price-yet you make no long-term commitment

The Collector's Edition of the Heirloom Library will be

issued at the convenient rate of one great book per month, for just \$19.50 a volume—a price guaranteed for the duration of your subscription. However, you need make no long-term commitment. You may cancel your subscription at any time, on 30 days' written notice.

### The rare pleasures of owning this personal library

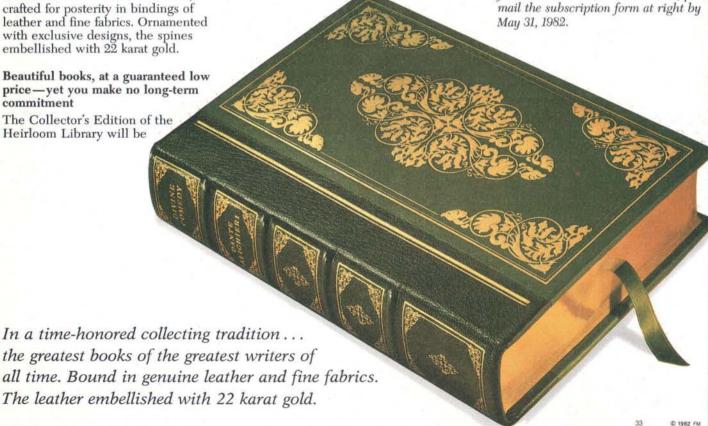
As a subscriber, you would enjoy, whenever you wish, the rich pleasure of taking one of these books from your shelf-with its fragrance of leather, its satisfying weight in your hands. Then savor a moment of anticipation as you open the volume, to see your own inscribed bookplate on the decorated endpapers. And leaf through the pages admiring the burnished edges . . . the smooth, opaque

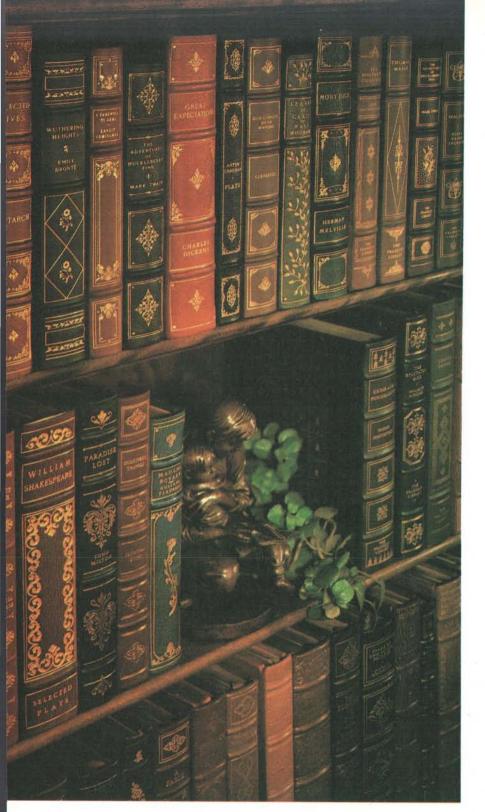
paper...the crisp, legible type... the wonderfully evocative illustrations.

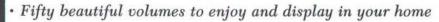
Above all, you would be able to enter at will . . . as one embarking on voyage of discovery . . . the world of Hemingway or Melville, Shakespeare or Dante, Dickens or Mark Twain. The greatest books ever written, in bindings worthy of the incomparable works they contain.

### Mail your order by May 31st

By the time your library is complete, even ordinary books may be selling for more than \$19.50. For the costs of materials, of printing and binding, are rising almost daily. And thus it may never again be possible to offer subscriptions to the Collector's Edition of the Heirloom Library at this guaranteed low price. So, to be sure of acquiring this remarkable private librar for no more than \$19.50 a volume, pleas mail the subscription form at right by May 31, 1982.

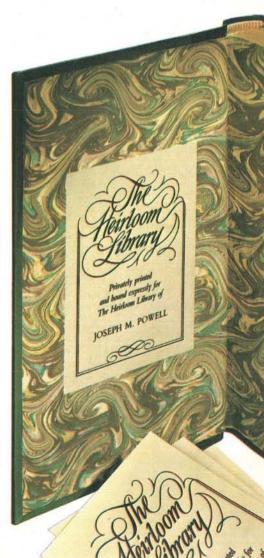






- Issued monthly at a price not much higher than you pay for an ordinary book just \$19.50 a volume
- · Price guaranteed for the duration of your subscription
- To be sure of acquiring your library at this low price, your subscription form should be postmarked by May 31, 1982





# New Software

WordIndex IITM \$195
Automatic generation of subject index and tables of contents, figures, etc.

WordIndex commands placed in any document produced by WordStar<sup>TM</sup> automatically number chapters and **8 levels** of sections; create tables of contents, figures, and tables, and a **sorted** subject index with page references.

### WordIndex II is loaded with new features:

Multiple files. WordIndex II supports the WordStar $^{TM}$  .fi dot command.

Free choice of page number format.

Multiple choice of layout of all tables.

No limit on size of subject index.

Automatic generation of headings and footings.

Alternating page offset for even and odd pages simplifies printing procedures.

SPECIAL OFFER for owners of all previous versions of WordIndex: return your original WordIndex diskette directly to us and receive WordIndex II at a nominal cost of \$50.

### MicroPlot<sup>TM</sup> \$39.100% Tektronix Plot-10 TCS compatible graphic package.

Previously available on minis and mainframes only.

Supplied with the original Tektronix<sup>TM</sup> documentation, MicroPlot fully implements the entire Tektronix Terminal Control System on your 8080/Z80 based microcomputer at a fraction of the original cost.

This package enables you to run even mainframe-developed software for the Plot-10 TCS on your microcomputer using Tektronix compatible peripherals.

MicroPlot is supplied as Microsoft<sup>TM</sup> .REL files to be used with Fortran-80<sup>TM</sup>.

## MenuMaster<sup>TM</sup> \$95 Stop messing around with CP/M commands. MenuMaster makes all your software menudriven.

Simply create your **own** menus directly on-screen using any text editor. The menu dispenses of long and hard-to-remember CP/M<sup>TM</sup> commands. The user may simply select programs from the menu using sim-

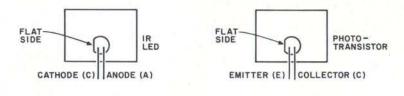
ple commands of his own choice.

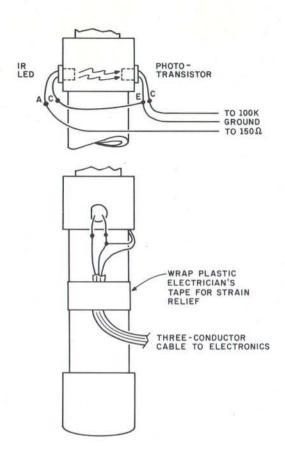
Order your copy today directly from us by phone, telex, or mail. Please send cashier's check or state Visa or Master Charge ac-

Detailed descriptions may be requested at no cost. Just circle reader service. Dealers may apply for free demo-versions of all programs.

### **BORLAND Ltd.**

69, Upper Georges Street Dun Laoghaire Dublin, Republic of Ireland Phone 1802514. Telex 25105 GSOP ATTN. BORLAND





**Figure 12:** The infrared LED and phototransistor are mounted on opposite sides of the anemometer shaft. Each shaft revolution produces two infrared light detections.

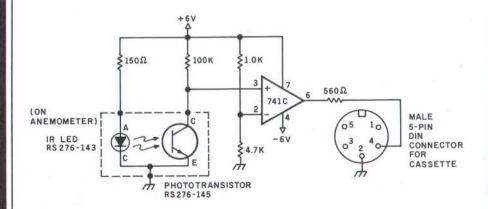


Figure 13: The electronics portion of the anemometer uses a few simple components but can provide a precise measurement of anemometer rotation speed.

# The Guesswork Is Gone!

Thanks to Strictly Soft Ware.

Consider the care you invested in buying your computer. We've done the same for your software.

How many times have you wondered: Is the package right? The price? The service?

We've cleared a course for you to the

best software — quality and price.

**Strictly Soft Ware** brings you the best in entertainment, education, performance, and price.

Take a look at the offerings below. And call now (toll-free) for our free catalog.

### \$19.95 SPECIALS

- Space Eggs
- Sneakers
- Beer Run
- Dark Forest

### \$19.95 SPECIALS

- Raster Blaster
   ABM
- Jawbreaker
- Crossfire
- Sabotage
- ADM
- Castle Wolfenstein
- Olympic Decathalon
- Ceiling Zero

Magic Window

### **Arcade Games**

Track Attack

Snack Attack

Midnite Magic

Red Alert

Apple-oids Apple Panic Autobahn Beer Run Bug Attack Compucube Computer Air Combat Computer Baseball County Fair Crossfire Cyber Strike Dark Forest Dogfight Epoch Firebird Flight Stimulator Gamma Goblins Genetic Drift Gobbler Golden Mountain Gorgon Hadron Hi Res Soccer Intl Gran Prix Missle Defense Mouskattack Olympic Decathalon Orbitron Outpost Pool 1.5 Pegasus II

Raster Blaster Reversal Robot War Ruski Duck Snack Attack Sneakers Super Invaders Star Thief Space Eggs Space War Space Quarks Thief Three Mile Island Track Attack

### **Adventures**

Trick Shot

Warp Attack

Adventures 1-12
Alkemstone
Akalabeth
Adventure to Atlantis
Castle Wolfenstein
Crush, Crumble, Chomp
Cyborg
Galactic Empire
Lords of Karma
Creature Venture
Mystery House
Napoleon's Campaigns
Oldorf's Revenge
O0 Topos
The Prisoner
Race for Midnight

Southern Command Space Adventure Swordthrust Talawa's Last Redobtd Stone of Sisyphus Tarturian Temple of Apshai The Terrorist Time Zone Ulysses/Golden Fleece Ultima Wizard/Princess Wizardry Zork

### Business

Accounting Continental Peachtree Broderbund The Apple Speller ASCII Express Creative Financing Data Capture Data Factory DB Master **DB Master Utility** Desk Top Plan II Easywriter Eduware Financial Partner Graphtrix Letter Perfect Magic Spell

The Mail Room The Merger Menu Generator Micro Courier PFS PFS Report Real Estate Analyzer Spellstar Superscribe II Super Text II TASC Compiler Tax Manager Tax Preparer Versaform Visiblend Visicalc 3.3 Visidex Visifactory Visifile Visiterm Visitrend/Visiplot Wordstar Z-80 Cards

### Home/Personnel

Decision Master The Correspondent Diet Planning Financial Management System II Home Money Minder Mastertype

Above titles are partial selection. Call for prices and catalog.



Phantoms Five

We take Master Card or VISA (include card # and expiration date). Ohio residents add 5.5% tax. Include \$2.00 for postage.

Send for free catalog. Prices subject to change.

### Strictly Soft Ware

Post Office Box 338 Granville, Ohio 43023 order by phone 800-848-5253 in Ohio 614-587-2938



Listing 9: Color Computer assembly-language program to measure the period of a cassette input signal.

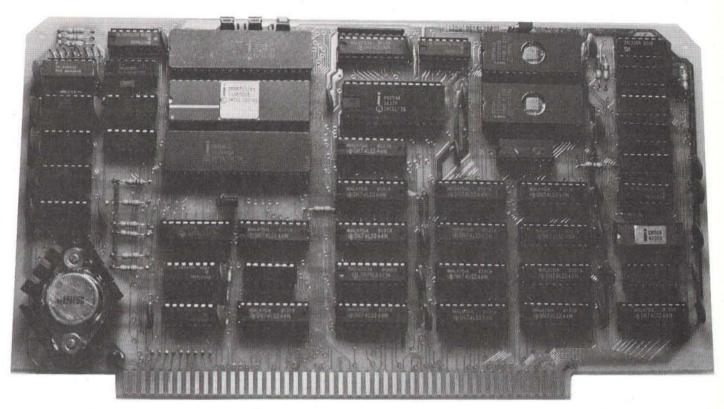
3F00	00140 00150	* SUBROI * INPI * OUTI * ******	UTINE TO UT: NIL PUT: 3FFI OR -	MEASURE EH=PERION 1 IF TIN	**************************************
3F00 0E 0000 3F03 30 01 3F05 27 30 3F07 B6 FF20 3F0A 84 01 3F0C 26 F5 3F0E 0E 0000 3F11 30 01 3F13 27 22 3F15 B6 FF20 3F18 04 01 3F1A 27 F5 3F1C 0E 0000 3F1F 30 01 3F23 06 FF20 3F24 01 3F28 26 F5 3F2A 30 01 3F2C 27 09 3F2E 0F720 3F31 04 01 3F33 27 F5 3F33 27 F5 3F35 20 03 3F37 0E FFFF 3F3A 0000	00190 00190 00200 00210 00220 00230 00250 00250 00270 00280 00310 00310 00350 00350 00350 00360 00390 00390 00410	PER030 PER050 PER090	DEED ABLUEED A	#0 1,X 9EFF20 #1,X 9EFF20 #10 #0 1,X 90 #10 1,X 90 #11 PEFF20 #11,X 90 #10 #10 #10 #10 #10 #10 #10 #10 #10 #1	TIME OUT COUNT INCREMENT TIME OUT CHT GO IF TIME OUT GET PIA BYTE GET CASSDIN GO IF AT PULSE INITIALIZE TIME OUT CHT INCREMENT TIME OUT CHT GO IF TIME OUT GET PIA BYTE GET CASSDIN GO IF NOT PULSE INITIALIZE TIME OUT INCREMENT TIME OUT CHT GO IF TIME OUT GET PIA BYTE GET CASSDIN GO IF STILL PULSE INCREMENT TIME COUNT GO IF TIME OUT GET PIA BYTE GET CASSDIN GO IF TIME OUT GET PIA BYTE GET CASSDIN GO IF NOT END NORMAL RETURN FLAG TIME OUT RETURN WITH ARGUMENT RETURN
00000 TOTAL ERRORS					

Listing 10: Model III assembly-language program to measure the period of a cassette input signal.

7FØØ		00100		ORG	7FØØH	; RELOCATABLE
		00110	;*****	*****	********	**********
£		00120	* SUBR	OUTINE	TO MEASURE I	PERIOD OF LOW-FREQ SIGNAL *
		00130	;* I	NPU.T:	NIL	*
		00140	;* O	JTPUT:	HL=PERIOD II	N 24.33 MICROSECOND UNITS *
		00150	; *		OR -1 IF TI	ME OUT, 2 BYTES *
		00160	;*****	*****	*******	**********
		00170	;			
7FØØ	210000	00180	PERIOD	LD	HL , Ø	TIME OUT COUNT
7FØ3	010100	00190		LD	BC,1	; INCREMENT
7FØ6	09	00200	PERØ1Ø	ADD	HL, BC	; INCREMENT TIME OUT CNT
7FØ7	3829	00210		JR	C, PERØ9Ø	GO IF TIME OUT
7FØ9	DBFF	00220		IN	As (ØFFH)	GET I/O BYTE
7FØB	E601	00230		AND	1	GET CASSDIN
7FØD	20F7	00240		JR	NZ, PERØ1Ø	GO IF AT PULSE
7FØF	210000	00250		LD	HL, Ø	REINITIALIZE TIME OUT CNT
7F12	09	00260	PERØ2Ø	ADD	HL, BC	INCREMENT TIME OUT COUNT
7F13	381D	00270		JR	C, PERØ90	GO IF TIME OUT

# The Lightning One

### 8086/8087/8089 CPU Board



### Features:

- ☐ 4, 5, 8 or 10 MHz operation jumper selectable
- ☐ 8086 or 8088 main processor
- Independent I/O and memory waitstate generator
- ☐ Up to 16K bytes of onboard EPROM
- 9 vectored interrupts expandable to 65
- EPROM monitor with diagnostics and disk utilities
- ☐ 8087 and 8089 co-processors available onboard
- ☐ CP/M-86\* and MS-DOS\*\* software support

\*CP/M-86 is a trademark of Digital Research. \*\*MS-DOS is a trademark of Microsoft, Lightning One is a trademark of Lomas Data Products, Inc. The Lightning One™ is the fastest processor board available on the S100 bus today. It contains not one processor, but three processors all working in parallel. It uses the Intel 8086 as the main processor. The math capability is augmented with the 8087 math processor and the I/O handling capabilities are augmented with the 8089 dual channel I/O processor. The board complies with all IEEE-696 specifications.

If you have an 8 bit system presently, don't despair. The *Lightning One* is available with the 8088. The 8088 is fully software compatible with the 8086, but utilizes an 8 bit bus allowing use of your present 8 bit memories. When you are ready to upgrade to full 16 bit operation, you need only to unplug the 8088 and plug in an 8086 in its place. When using an 8088, the 8087 and 8089 may still be utilized.

In addition to the *Lightning One*, Lomas Data Products has a full line of S100 bus support cards including: memory, disk controllers, and serial and parallel I/O.

Prices for the Lightning One start at \$395.

### Coming Soon: New Product Announcements:

- □ 128 K byte non-volatile static RAM
- ☐ M DRIVE for CP/M-86 and MS-DOS
- ☐ Dual CP/M-86 and CP/M 2.2 support
- ☐ Winchester hard disk controller

For 16 bit computing on the S100 bus, come to the leader..

### LOMAS DATA PRODUCTS, INC.

729 Farm Road, Marlboro, Massachusetts 01752 
Telephone: 617-481-2822

Listing 1	0 continued:					
7F15	DBFF	00280		IN	A <sub>5</sub> (ØFFH)	GET I/O BYTE
7F17	E601	00290		AND	1	GET CASSDIN
7F19	28F7	00300		JR	Z, PERØ2Ø	GO IF NOT PULSE
7F1B	210000	00310		LD	HL , Ø	REINITIALIZE TIME OUT
7F1E	09	00320	PERØ3Ø	ADD	HL, BC	; INCREMENT TIME OUT
7F1F	3811	00330		JR	C, PERØ9Ø	GO IF TIME OUT
7F21	DBFF	00340		IN	A, (ØFFH)	GET I/O BYTE
7F23	E6Ø1	00350		AND	1	GET CASSDIN
7F25	20F7	00360		JR	NZ + PERØ3Ø	GO IF STILL PULSE
7F27	TATE OF THE PARTY	00370	PERØ50	ADD	HL, BC	; INCREMENT_TIME OUT
Carlot 1007 (470)	3808	00380		JR	C, PERØ9Ø	GO IF TIME OUT
7F2A	DBFF	00390		IN	A, (ØFFH)	GET I/O BYTE
7F2C	E601	00400		AND	1	GET CASSDIN
7F2E	28F7	00410		JR	Z, PERØ5Ø	GO IF NOT END
7F3Ø	1803	00420		JR	PERØ95	NORMAL RETURN
7F32	21FFFF	00430	PERØ9Ø	LD	HL,-1	FLAG TIME OUT
7F35	C39AØA	00440	PERØ95	JP	ØA9AH	PASS ARGUMENT BACK
0000		00450		END		

**Listing 11:** Color Computer BASIC driver program for the anemometer. This program uses the PERIOD program. The machine-language code for PERIOD is contained in the BASIC program and is poked into high memory.

```
100 'SAMPLE ANEMOMETER PROGRAM
110 DATA 142,0,0,48,1,39,48,182,255,32
120 DATA 132,1,38,245,142,0,0,48,1,39,34
130 DATA 182,255,32,132,1,39,245,142,0,0
140 DATA 48,1,39,20,182,255,32,132,1,38
150 DATA 245,48,1,39,9,182,255,32,132,1,39
160 DATA 245,32,3,142,255,255,191,63,254,57
170 FOR I=&H3F00 TO &H3F3D
180 READ A: POKE I,A
190 NEXT
200 DEFUSR0=&H3F00
210 CLS
220 A=USR(0)
230 A=PEEK(&H3FFE)*256+PEEK(&H3FFF)
240 IF A=65535 THEN A=0: GOTO 260
250 A=3.75/(A*20.23E-6)
260 PRINT @262, A; "MPH
270 GOTO 220
```

00000 Total errors

**Listing 12:** Model III BASIC driver program for the anemometer. This program uses the PERIOD program. The machine-language code for PERIOD is contained in the BASIC program and is poked into high memory.

```
1100 'SAMPLE ANEMOMETER PROGRAM MODEL III
110 DATA 33,0,0,1,1,0,9,56,41,219
120 DATA 255, 230, 1, 32, 247, 33, 0, 0, 9, 56
130 DATA 29,219,255,230,1,40,247,33,0,0
140 DATA 9,56,17,219,255,230,1,32,247,9
150 DATA 56,8,219,255,230,1,40,247,24,3
160 DATA 33,255,255,195,154,10
170 FOR I=32512 TO 32567
180 READ A: POKE I,A
190 NEXT I
200 DEFUSR0=&H7F00
210 CLS
220 A=USR(0)
230 IF A=-1 THEN A=0:GOTO 250
235 IF A<Ø THEN A=65536+A
240 A=3.75/(A*24.33E-6)
250 PRINT @ 532, A; "MPH
260 GOTO 220
```

rotation is detected, a -1 is returned as the period; both BASIC programs look for this flag and set the period to 0 in this case.

Wind speed will be displayed in the center of the screen. Wind speed in this case is a rough calculation based on preliminary empirical tests. The tests involved driving madly down city streets while keeping one eye on the road and the other on the rotating anemometer held at arm's length out the open car window. The 12-V DC-powered inverter for mobile computer operation is a project I'll leave for you in your spare time.

Each rotation of the shaft produces two pulses. A wind speed of 15 miles per hour (mph) is approximately 2 revolutions per second—thus the "3.75" factor. Rotational speed of the anemometer appears to be linear; 30-mph wind produces 4 revolutions per second and so forth. I would be very interested to hear from readers who construct the anemometer and run some tests with it, especially those who have access to a wind tunnel.

The above examples illustrate what can be achieved without a great deal of additional hardware when using inputs that were not meant to be discrete inputs but were dragged, kicking and screaming, into duty. In a later article, I'll look at a more sophisticated way to interface many lines to the system bus. I promise you won't be cutting up PVC tubing and scrubbing cement off your hands.

### Your computer.

Your printer.

Compute.

Compute.

Compute.

Compute.

Compute.

### Dump...

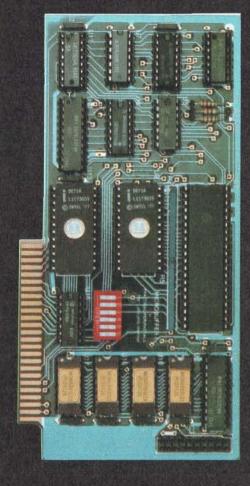
Compute.

Compute.

Compute.

Compute.

Compute.



... Print.

Print.

Print.

Print.

Print.

Print.

# New Microbuffer II lets you use your printer without tying up your computer.

Time. As an important resource it shouldn't be wasted. One such waste is in printing, where your computer must wait for your printer. Now there's a way to eliminate this waste.

Introducing the Microbuffer  $I_{-}^{TM}$ , a buffered parallel printer interface for the Apple  $I_{-}^{**}$  computer with 16K characters of memory (user expandable to 32K). It accepts data as fast as your computer can send it, allowing you to use your computer while the Microbuffer  $I_{-}$  is in control of your printing.

The Microbuffer II, compatible

with Applesoft, CP/M<sup>\*\*</sup> and Pascal, comes with complete print formatting features as well as advanced graphics dump routines for most popular graphics printers.

The Snapshot<sup>™</sup> option permits you to dump the text screen or graphics picture to the printer while any program is

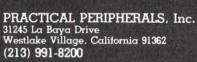
BUFFER II

Microbuffer II and Snapshot are trademarks of Practical Peripherals. Inc.

CPIM is a registered trademark of Digital Research, Inc.

Apple II is a registered trademark of Apple Computer, Inc.

option is \$69.



running — without interuption.

available for \$259. And the 32K

version, for \$299. The Snapshot

So why waste time while your

computer waits for your printer?

Ask your computer dealer for

the Microbuffer I or call us for

the name of a dealer near you.

The 16K Microbuffer I is



Circle 340 on inquiry card.

# The \$14995 personal computer.

### Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only \$149.95\* completely assembled

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

### A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80-the world's largest selling personal computer and the first for under \$200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much. Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical
- \* Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

### If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only \$39.95, plus shipping and handling-complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

> With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

### Order at no risk\*\*

We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

\*\*Does not apply to ZX81 kits



**NEW SOFTWARE:**Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than \$100.



**16K MEMORY MODULE:** Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is \$99.95, plus shipping and handling.



ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A \$10.95 value, it's yours free with the ZX81.

# The \$9995 personal computer.

### Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just \$99.95\* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

### How to order

Sinclair Research is the world's largest manufacturer of personal computers.

The ZX81 represents the latest technology in microelectronics, and it picks up right where the ZX80 left off. Thousands are selling every week.

We urge you to place your order for the new ZX81 today. The sooner you order, the sooner you can start enjoying your own computer.

To order, simply call our toll free number, and use your MasterCard or VISA.

To order by mail, please use the coupon. And send your check or money order. We regret that we cannot accept purchase orders or C.O.D.'s.

CALL 800-543-3000. Ask for operator #509. In Ohio call 800-582-1364. In Canada call 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your Master-Card or VISA ready.

These numbers are for orders only. For information, you must write to Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

sinclair

ZX81	\$149.95		
ZX81 Kit	99.95		BAR BAR
8K BASIC chip (for ZX80)	39.95		
16K Memory Module (for ZX81 or ZX80)	99.95		
Shipping and Handling	4.95		\$4.95
	The state of the state of	TOTAL	ELECTRIC III

MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

NAME

ADDRESS.

CITY/STATE/ZIP\_

† U.S. Dollars

# The Input/Output Primer Part 4: The BCD and Serial Interfaces

A look at one of the least understood interfaces— RS-232C—and one of the first instrument interfaces.

Steve Leibson
Auto-Trol Technology Corporation
12500 North Washington St.
POB 33815
Denver, CO 80233

In Part 3 of this series, we looked at the parallel and HPIB or GPIB (IEEE-488) interfaces. This month we turn our attention to the BCD (binary-coded decimal) interface and

This article is the fourth in Steve Leibson's six-part series, The Input/Output Primer. The series describes the problems involved in communications between computers and the outside world and explains how some of these problems have been solved. The two remaining articles will discuss character codes and interrupts, buffers, grounds, and signal degradation. "An I/O Glossary," which defines many terms used in these articles, appeared with the first installment (February 1982 BYTE, page 122). Figure and table numbers are continued from Part 3.

the RS-232C serial interface. Both of these interfaces are older than those previously covered. The BCD interface traces its origins to scientific instruments that have been in use for decades. The serial interface's roots go back much farther, to the days when buffalo grazed the prairies of North America and André Ampère had an idea for a new method of communication. Let's look first at the BCD interface.

### The BCD Interface

The BCD interface has remained popular because it provides a link to older measuring instruments that have been turning out reliable data for years. Some designers still put BCD interfaces in new digital instruments because the BCD interface is simple and inexpensive.

When scientists first connected

measuring instruments to computers, existing instruments lacked the electronic sophistication needed to use either the parallel or the IEEE-488 interface. Engineers were faced with developing an interface that relied on the intelligence of the computer to manage communications between the computer and the instruments.

Because measuring instruments send information to the computer but receive no information from it, the new interface could be unidirectional. There might be control lines from the computer to actuate ranges or control other aspects of the instrument's readings, but the control lines did not have to send data.

The new interface also had to accept a very wide word of data. For reasons that will become clear after I discuss the BCD coding method, high-resolution measuring instru-

# Introducing The Final Word!

## Word processing that goes beyond the stars.

How could anyone call their word processor The FinalWord? Take the best features of the most popular

The

word processors, combine them and add a few more in one text editor/formatter and you'd be off to a good start. Then, write the program in C to allow user customization and make it capable of supporting any printer on the market and you'd be ahead of everybody else. If you went one

everybody else. If you went one step further and made your word processor transportable from one terminal to another you'd have—The FinalWord.

Supports multiple printers: The FinalWord allows you to produce high-speed draft copies on one printer, and letter-quality on another. It also means you'll never need another version just because you bought a new printer.

### User-installable on different hardware:

With The FinalWord you can upgrade your system and still have a familiar screen display. And since we've written The FinalWord in C, new versions are available almost as soon as new computers.

Features that go beyond the stars: Look at what you get with The FinalWord: automatic generation of Table of Contents, Index, footnoting and chapter/section numbering; enhanced command sets (delete/move a letter, word, sentence, paragraph, page); multiple buffers and windows, deletion recovery, true proportional spacing and more. And because we wrote The FinalWord to be easily reconfigured for different systems, our price can be lower.

Features	The FinalWord	WordStar	Magic Wand		
Full-Screen Editing	Yes	Yes	Yes		
Directory Access while Editing	Yes	Yes	Yes		
Simultaneous Printing while Editing	g Yes	Yes	Yes		
External Commands while Editing	Yes	Yes	No		
Video Highlighting	Yes	Yes	No		
Automatic Footnotes	Yes	No	No		
User-Defined Commands	Yes	No	No		
Multiple File Editing	Yes	No	No		
Deletion Recovery	Yes	No	No		
Supports Multiple Printers	Yes	No	No		
Crash Recovery	Yes	No	No		
Dynamic Include Files	Yes	No	Yes		
Suggested Retail Price	\$300	\$495	\$395		

The FinalWord requires a 56K CP/M system and video terminal with cursor positioning character sequences. It is presently available in 8" standard format for the TRS-80 Model II, Vector Graphics and Altos Systems. There are compatible versions for the HP-125, Xerox 820, Cromemco, Micropolis, Ohio Scientific and Dynabyte Systems, and there are 51/4" versions for the Heath/Zenith Z-89, Northstar, Apple and Superbrain. **Coming Soon:** 

The FinalWord for the IBM Personal Computer.

The FinalWord is available through leading retailers, Westico, and Discount Software, or directly from:

Mark of the Unicorn PO BOX 423 Arlington, Massachusetts 02174 (617) 489-1387

Dealer and OEM inquiries invited. Call for delivery schedule. Reserve yours now!



Mark of the Unicorn



(CPM) techniques and PERT to determine task dependencies and project completion dates. The user creates tasks, assigns costs and defines task dependencies. The interactive system immediately redisplays the project plan as data is entered. Projects are displayed as Gantt charts, labor time summaries and financial summaries.

MicroGANTT features: Time scale of days, weeks, months, auarters or years can be varied at any time to present more or less detail. Accommodates unlimited number of tasks in a project plan. Detailed sub-projects can be included as tasks in a project model. Assumptions are easily modified to make "What if?" analyses. Single key-stroke commands page through tasks and calendar of events on display screen. Single key-strokes switch the display from Gantt chart to labor time summary to financial summary. Partial allocation of manpower to tasks. Partial completion of prerequisite tasks. All charts, reports and plans can be printed.

Available for IBM Personal Computer and CP/M compatible computers. Software and manual \$395. Manual alone \$25.

### 4 ways to order:

- · Write Westico, Inc., 25 Van Zant Street, Norwalk, CT 06855
- Call (203) 853-6880
- Telex 643-788
- Dial-up our 24-hour computer (300 baud) (203) 853-0816

copyright @ 1982 Westico, Inc.



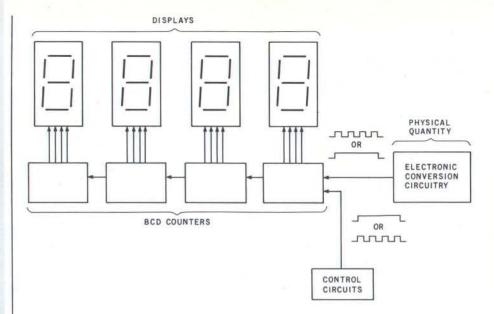


Figure 10: Block diagram of a BCD instrument. Two signals drive a string of single-digit binary-coded decimal (BCD) counters. One signal is a representation of the physical quantity being measured. This signal may be either a pulse of controlled duration or a series of pulses whose frequency is proportional to the physical quantity being measured. The second signal, from the control circuits, is used for timing.

ments may have I/O (input/output) connectors with as many as 40 or 50 pins. The new interface had to permit the peripheral instrument to present its entire message at once, sometimes as many as 50 bits in parallel. Then the interface had to break up this wide parallel word into pieces that the computer could digest more easily.

### Binary-Coded Decimal Numbers

BCD is a method that expresses each of the 10 decimal numerals (0 through 9) in a binary code. The coding sequence is:

	Bi	nai	y (	Decimal	
Bit #	3	2	1	0	Numeral
	0	0	0	0	0
	0	0	0	1	1
	0	0	1	0	2
	0	0	1	1	3
	0	1	0	0	4
	0	1	0	1	5
	0	1	1	0	6
	0	1	1	1	7
	1	0	0	0	8
	1	0	0	1	9

Note that 4 binary digits (bits) are required to represent the numerals 8 and 9. Codes 1010 through 1111 are

not used. Consequently, BCD coding is not as efficient as pure binary coding, but the ease with which BCD can be displayed for human operators offsets its inefficiency in code compac-

The standard calendar presents an analogy. Each page contains 5 weeks, more than enough space to hold the days in any month. The extra spaces for days remain blank. That extra space is useless to the printer, but because we do block the days of the year into months, the convenience of placing each month on a separate page more than makes up for the wasted space.

Since each decimal digit in BCD coding takes 4 bits, each digit of a scientific-instrument reading requires 4 wires to transmit the binary values that express that digit. Scientific instruments make all digits available simultaneously on the I/O connector, and high-resolution instruments can have connectors with as many as 50 pins. That explains why the BCD interface has to be able to accept such wide data words.

### Implementing the BCD Interface

What makes the BCD interfacing technique easy to implement in

# **ILANGUAGE**IPROCESSORS

When it comes to providing quality programs for serious microcomputer users — come to Westico. And you'll find more than quality software. You'll find instant response. In most cases, your order will be shipped within 24 hours. You'll also find the technical expertise on staff when you need help. For language processors and lots more, it's Westico. Here's just a sample of the more than 150 quality programs currently in stock:

PL/1-80<sup>11</sup> — Powerful application programming language for microcomputers. Implements on a micro the ANS Subset G language for minicomputers. Includes native code compiler, LINK-80 linkage editor, LIB-80 subroutine library manager. PLILIB run-time library and RMAC relocatable macro assembler. \$475/\$35. LINK-80 and RMAC also available separately.

BT-80" — Efficient B-tree key indexed access method for PL/I-80. Features key length to 63 bytes, unique or duplicate keys, and data records to 4096 bytes. Datasets can be spread over 8 files for a total of 64 megabytes. \$200/\$30.

BASIC-80 — Extremely fast interpreter features double precision floating point math, 40 character variable names, CHAIN/COMMON, random and sequential files, EDIT, CALL with parameters and an overlay technique. \$350/—.

BASIC COMPILER — Compatible with BASIC-80. Produces extremely efficient, optimized 8080/Z80 machine code. Includes macro assembler, linkage editor and subroutine library manager. Compiled programs can be linked with FOR-TRAN-80, COBOL-80, and assembly language programs. \$395/—.

CBASIC — BASIC language compiler/interpreter for development of financial and business appli-

cation programs. System \$120/\$20. CBASIC-86—Implementation of CBASIC for CP/M-86. INT files compatible with CBASIC and supports 128K main memory. Requires CP/M-86 or MP/M-86. \$325/\$30. cB-80 — Native code 8080 compiler of CBASIC language. Offers all of the features of CBASIC plus the speed and versatility of a compiler. Includes linkage editor which can create overlay modules. Supports CP/M and MP/M II. \$500/\$30.

FORTRAN-50 — Includes full ANSI standard X3.9 except COMPLEX data type. \$500/—.

LYNN:—Friendly overlay linkage editor for creating COM files from Microsoft compatible REL files. Constructs programs that use all available memory including that used by LYNX itself. Program size can be increased at least 9K without using the overlay feature. The overlay option is vital to programs larger than available memory. Easy to use with BATCH and HELP commands. \$250/\$25.

PASCAL/MT+ — Compiler produces 8080/Z80 code. Standard REL file can be linked with other languages. Includes linker, debugger disassembler and special Speed Programming Package with editor and Pascal syntax checker. \$475/\$30.

Level 1 requirements and most useful features of Level 2. SCREEN SECTION for definition of CRTs. \$750/—.

\*\*ASM:\*\*C\*\*—Family of microprocessor-cross-assemblers. Designed to run on 8080/Z80 based microcomputers under a CP/M-like operating system. Support for Motorola 6800, 6801.

6803, 6805, 6809; RCA 1802; COP400; Intel 8048, 8051; MOS 6502. \$200/\$25. \*\*XLT26\*\* — Translates Intel 8080 assembly language source code into optimized Intel 8086 source code. \$150/\$10.

The Westico 24-Hour Computer Hotline (203) 853-0816 (300 baud) for detailed information and quick



• Westico has more than 150 programs for professionals and businesses that use a wide variety of microcomputers including: TRS-80 Model II, Apple, Vector Graphic, Cromemco, North Star, Micropolis, Ohio Scientific, Altos, Dynabyte, IBM, Intertec, Xerox, Zenith, Northern Telecom, AVL Eagle and more. We're working hard to be your software company.

For FREE catalog
aircle reader service number. More
than 150 quality programs in stack.

### 4 Ways to order

- Write Westico, Inc., 25 Van Zant Street, Norwalk, CT 06855.
- · Call (203) 853-6880.
- Telex 643-788
- Dial-up our 24-hour computer (300 baud) (203) 853-0816.

COD, MasterCard and VISA accepted.

Prices do not include shipping and are subject to change. In CT add 7½% sales tax. All sales final.

Manual price may be credited toward purchase of software.

Dealer inquiries invited.

WES-43

Copyright © 1982 Westico, Inc.

WESTICO
The Software Express Service

25 Van Zant Street • Norwalk, Connecticut 06855 (203) 853-6880 • Telex 643-788

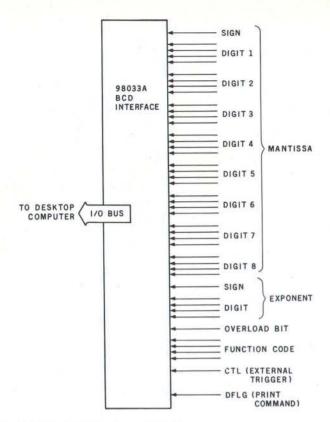


Figure 11: The 98033A BCD interface. This figure shows how a computer reads in the digits of a BCD instrument. The counters are connected to the BCD interface, which reads in each digit, converts the BCD data to characters, adds delimiting characters, and sends the entire message to the computer. CTL is an external trigger that tells the instrument to take a reading. DFLG (print command) is a signal from the instrument indicating that a valid reading is represented on the digit lines. These two signals, CTL and DFLG, are the handshake lines between the interface and the instrument.

measuring instruments? The answer lies in the circuitry used to do the measuring.

Figure 10 shows a diagram of a typical measuring instrument. Input to the instrument such as voltage, current, or weight is fed to an electronic circuit that converts the physical parameter to a signal that represents the parameter. This signal may be either of two types: a square wave or a pulse.

A square wave alternately takes on two different fixed values for equal lengths of time. If the signal produced by the instrument is a square wave, the physical quantity measured by the instrument determines the wave's frequency. The frequency is fed to the input of a counter that is allowed to count for a precisely controlled period of time.

If the signal produced by the instrument is a pulse, the physical quantity measured determines the pulse's dura-

May 1982 @ BYTE Publications Inc

tion. The pulse is used to control a counter that is clocked by a precise square wave of known frequency.

Whether the signal starts as a frequency or a pulse, the result is a count proportional to the input parameter. The counter drives the digits in a display. If the counter counted in binary, the display would be difficult to read because we think in decimal.

Fortunately, it's possible to use BCD counters in the counter that drives the display. If several BCD counters are placed in series (or cascaded), they produce outputs easily displayed in decimal. This works in much the same way as an odometer. Each wheel of the odometer has the numerals 0 through 9 printed on it. Every time a wheel on the odometer makes a full turn, it advances the wheel to the left of it by one count. In a chain of BCD counters, each time a digit advances from 9 to 0, it ad-

vances the next higher counter by 1. Each BCD counter has 4 digital output lines that represent the state of the counter. These outputs are used to drive one digit in the display. The digits combine to form the complete reading of the instrument.

This technique is used in a remarkably wide range of digital measuring instruments, including digital clocks. Most instruments use this counting technique to convert a physical quantity into a digital display; in the case of digital clocks, of course, the quantities are periods of time.

### The BCD Interface Is Born

The first accessory that designers added to their digital instruments was a printer, which made it possible for an unattended instrument to log its own readings. Signal lines were brought out of the instruments to drive the print wheels—one print wheel for each digit. These signal lines were nothing more than the digital output lines of the BCD counters in the instrument. The counters drove the display and positioned the print wheel just before it struck the paper.

By supplementing the counter output lines with just two more signals, designers created the BCD interface. One of the added signals told the printer when the reading was valid (print command), and the other allowed the printer to pace the readings (external trigger) so that the instrument would not take readings faster than the printer could print them. These two signals form the handshake mechanism of the BCD interface.

At its birth BCD interfacing was a big success. Experiments that had required an attendant to write down readings (usually some unlucky graduate student or technician) could now be automated. Printed logs could be obtained for production testing. The tedious job of recording data was greatly simplified. If a printer could do all that, just think what could be done by substituting a computer for the printer! The system would not only log information but also analyze it, process it, and take

### Powerful CP/M Software.

For Apple, Osborne, TRS-80, North Star, SuperBrain, Micropolis, Vector and others.



### NEVADA COBOL

\$199.95 For all CP/M or MP/M based computer systems with 32K RAM and one disk drive.

When we introduced Nevada COBOL three years ago, it was loaded with innovations. Today's Edition 2 is even better! For example:

- ☐ Compare speed. It's 4 to 20 times faster than any other micro COBOL according to an independent study.\* What's more, its easier to use.
- ☐ Compare documentation. You get a 153-page manual with lots of examples and 16 complete COBOL source code programs.
- ☐ Compare memory requirements. Extremely compact. You can compile and execute 2500 statements in 32K RAM, 4000 statements in 48K, etc.
- ☐ Compare features. It's based upon the ANSI-74 standards with level 2 features such as compound conditionals and full CALL CANCEL.
- ☐ Compare royalties. You can distribute your object programs royalty FREE!
- ☐ Compare support. If you have a technical question, you talk directly to the author.

### **NEVADA PILOT**

by John Starkweather.

\$149.95 For all CP/M based computer systems with 32K RAM, 1 disk drive and CRT or video display and keyboard.

- ☐ It's so easy to use, you'll be writing interactive applications within the first hour.
- ☐ Perfect for industrial training, office training, drill and testing, virtually all programmed instruction, word puzzle games, and data entry facilitated by promots.
- ☐ What's more, John Starkweather,
  ☐ What's more, John Starkweather,
  Ph.D., the inventor of the PILOT language, has added many new features to Nevada PILOT. There are commands to drive optional equipment such as Video Tape Recorders and Voice Response Units. There's a built-in full screen text editor and much more.
  ☐ Meets all PILOT-73 standards for full compatibility with older versions.
  ☐ You get a diskette, 146-page manual and ten useful sample programs.
- \*"A Compiler Benchmark: A Comparative Analysis of Four COBOL Compilers" by Stephen F. Wheeler. CP/M and MP/M are registered trademarks of Digital Research, Inc. TRS-80 is a registered trademark of Tandy Corp. © 1982. Ellis Computing.

### **NEVADA EDIT**

\$119.95. For all CP/M based systems with 32K RAM, 1 disk drive and CRT or video display and keyboard.

- ☐ A character-oriented full-screen video display text editor designed specifically to create COBOL, BASIC, PASCAL and FORTRAN programs.
- ☐ Completely customizable tab stops, default file type, keyboard layout and CRT by menu selection.
- ☐ The diskette comes with an easy-to-read manual.

### Order now! (415) 751-1522

We welcome COD's





Ellis Computing 600 41st Avenue, Dept. B San Francisco, CA 94121 U.S.A.



ELLIS COMPUTING SOFTWARE TECHNOLOGY X = BCD DIGIT Ov= OVERLOAD BIT CHARACTER 15 = FUNCTION CODE

Figure 12: The BCD message format is a floating-point number in scientific notation followed by a comma, an overflow character, a function code, and a linefeed terminator. The floating-point number is represented by a sign, a mantissa, an "E" which indicates that an exponent follows, an exponent sign, and an exponent. Unused BCD digit inputs may be grounded; they will then be transmitted to the computer as 0s.

appropriate action. The eyes and ears of a computerized process control loop were about to come into being.

### A Real BCD Interface

Let's look at an actual BCD interface. My example will be the Hewlett-Packard 98033A BCD interface designed for the 9800 series of desktop computers (see figure 11).

The 98033A has several inputs that connect to the BCD instrument. Enough signal wires are included for an 8-digit mantissa with a sign bit and a 1-digit exponent, also with a sign bit. If this terminology is unfamiliar, think of a number, say, 1,427,327. That is how you might write it. In scientific notation, that number is:

### $1.427327 \times 10^{6}$

The 1.427327 is called the mantissa and represents the significant figures of the number. The 6 is the exponent and represents the power of 10 by which the mantissa is multiplied to get the value of the number.

In addition to the mantissa and exponent inputs, the 98033A has an overload input bit and inputs for a

3043

3328

CP/M

4-bit function code. Unlike the odometer, most instruments don't roll the display back to 0 when a counter reaches maximum count plus 1. Instead, they indicate an overflow, informing the operator that the input is too big to measure. The functioncode bits are useful for instruments that can measure more than one range or quantity.

When the computer takes a reading, the interface scans each digit and converts the BCD values into ASCII characters. The ASCII characters are sent to the computer serially. A reading is composed of 16 characters. As shown in figure 12, 8 digits are available for the mantissa and 1 for the exponent; this format is usually sufficient to interface a BCD instrument. If the instrument has fewer digits to send, unused inputs may be grounded to read 0s.

### Interfacing Flexibility

Because no standard for BCD interfacing yet exists, the 98033A offers flexibility in the interpretation of signal wires. It can be configured to either positive- or negative-true signal

USERS LOOK OUT: S/S-PASCAL IS FASTER

levels. Input-signal voltages are constrained to be TTL-compatible, meaning that the low level is between 0 and 0.7 volts (V) and the high level is between 2 and 5.5 V. This signal level comes from the TTL logic circuit family, which has dominated digital designs since the late 1960s.

The tenth, thirteenth, and sixteenth characters of the ASCII string of characters sent by the interface are generated within the interface itself. They aid the computer in deciphering the meaning of the digits coming from the instrument. Character 10 is always an "E," which is shorthand for exponent. The "E" separates the mantissa from the exponent. The thirteenth character is a comma and separates the exponent from the function code. The sixteenth and last character, the linefeed or <LF>, is a message terminator, informing the computer that transmission of the reading is complete.

Intelligence in the 98033A replaces any that might otherwise have to reside in the instrument. The 98033A provides a data path between today's computers and earlier interfacing instruments. Furthermore, the 98033A eases the burden for today's designers who cannot justify the development and manufacturing costs required to include a more complex interface in a new instrument.

### The Unstandard Interface: Serial I/O

The first electronic digital computers appeared in the 1940s, and serious work in computer data com-

Execute AND REQUIRES ONLY 32K OF MEMORY S/S-PASCAL 12.5 1117 S/S-PASCAL Version 3.0 for 8080/8085/Z80 PL/180 \* 14.0

Write to get the whole story, or better send \$30.00 for 5977

- Demo discette with compiler (READ statement not included) and sample programs
- Tutorial manual (over 100 pages)

DON'T TAKE OUR WORD FOR IT, compile your own programs and test them before buying full compiler

S/S-PASCAL Version 3.0: \$295 - Demo discette: \$30 \* NEW, DISPOSE, MARK, RELEASE and more . . .

- Standard PASCAL features plus
- Generates optimized native code
- · Compiles directly into .com file
- External assembler subroutines
- Random access files
- 14 digit BCD floating point reals
- Chaining and overlays
- Dynamic strings
- · Powerful string manipulation
- · Direct access to memory
- Address and size functions

"We answer all inquiries the same day" Dealer inquiries welcome.

\* CP/M, PL/I 80 TM of Digital Research PASCAL MT+ TM of MT Microsystems PASCAL/Z TM of Ithaca Intersystems

Re: BYTE, September 1981, page 180

A high level language Benchmark

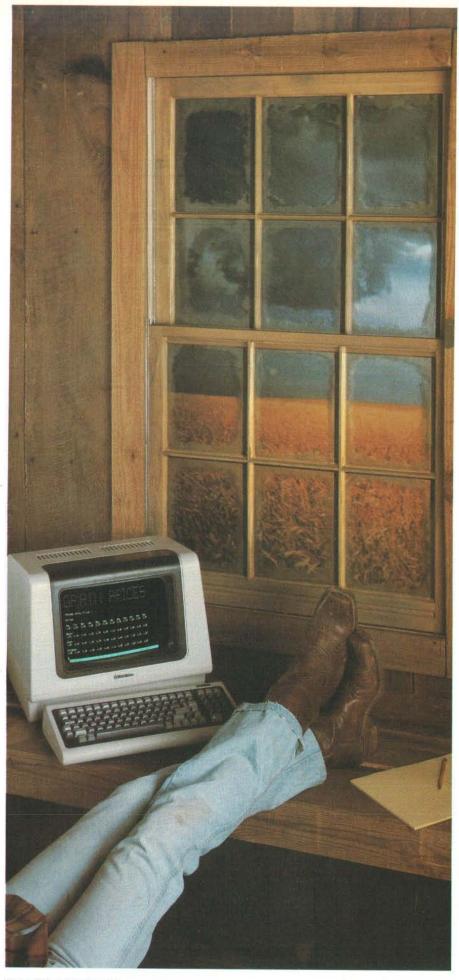
109

PASCAL MT+\* 19.0

PASCAL/Z \*

208

P. O. Box 197 SCOTIA SOFTWARE (902) Armdale, N.S. Canada B3L 4J9



# .001 Second From Wallstreet

Now, a terminal in western Kansas is no more than a microsecond from the data of Wall Street or the Commodities Exchange.

Now, an advanced data communications system allows your CP/M® based computer system to access almost any dial-up computer, capture and store the received data, and transfer files between any two CP/M® systems — even when disk formats are incompatible.

What would you call a system like this?

What Crosstalk can do for you depends mostly on what you need done. It acts as a "smart terminal." automatically dialing any dial-up system. It allows you total modem control, changing modem speed, data word format and duplex instantly. It captures on-line data for analysis off-line, saving time and money. It transfers any type of file with complete error checking.

When you equip more than one office with Crosstalk, you can exchange information instantly by phone, even if you don't subscribe to an information utilities service.

So no matter where your office is located, Crosstalk can give you access to the world, instantly. Call or write for details.



Microstuf, Inc. 1900 Leland Dr. Suite 12 Marietta, GA 30067 (404)952-0267

DEALER INQUIRES WELCOME

CROSSTALK is a trademark of Microstuf, Inc. CP/M is a registered trademark of Digital Research Inc.



complete specifications.

Serviced nationally by carterfone

### GNT AUTOMATIC II

1560 Trapelo Road, Waltham, MA 02154 (617) 890-3305 Telex: 923318

# maller Altern

Need a guick, easy way to talk to a computer? Here's a hand-held, fully portable computer terminal that gives instant access to any ASCII transmitting data system with an RS232 interface. It's the revolutionary G.R.

Electronics Pocket Terminal. POWER Pocket Terminal

The silent, solid-state terminal has a 40-key, positive click-response keyboard. From its 32-character internal memory it displays eight bright 16-segment LED characters through a one-line window.

You may select from two alternate display modes. Entries may be in any format required, and all memory data can be edited as desired.

Miniature switches allow selection of these options . Single or dual stop bits . Parity bit SET/RESET/EVEN/ODD . 300/110 baud transmission rates . Control code response ENABLE/DISABLE.

- Compact, Lightweight, Fully Portable
- 40 Multi-Function Keys
- 32-Character Memory
- Format-Controllable Input & Output
- Memory/Display Editing
- Large Eight-Char. LED Display Readable from 6 ft. Distance
- Full 128-Char. ASCII Transmit/Receive
- Two Selectable Transmission Rates

1640 Fifth Street, Santa Monica, CA 90401 Phone: (213) 395-4774 • Telex: 652337 (BT Smedley SNM)

munications didn't start until the next decade. When engineers began to connect computers to other devices. they drew upon serial I/O, a technology that had originated in the previous century.

The first electrical device used extensively for communications was the telegraph. Samuel Morse learned of André Ampère's idea for the telegraph in 1832. Morse improved the telegraph mechanically, but more important, he devised the Morse code. This was the first really practical encoding of human communications symbols into a form that is machinetransmittable.

Symbols are represented in Morse code by a series of dots and dashes, with each character having its own unique representation. The dots and dashes may be considered the predecessors of the 1s and 0s of the character codes we use in computer data communications today.

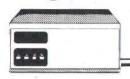
Improvements in the telegraph led to printing telegraphs that required no human operator to decipher the codes. New codes and more advanced machines evolved, culminating with the teletypewriter. By the time the teletypewriter was introduced, dots and dashes had become 1s and 0s. The Morse code gave way to codes that assigned the same number of bits to each character, making messages much easier for a machine to decode.

By the time the electronic computer came into being, a wealth of technology already existed for electronic data communications. Teletypewriters served as I/O devices between people and computers. The keyboard and printer of the teletypewriter provided a low-cost data entry and display mechanism. As technology progressed, cathode-ray tube terminals and faster printers replaced the teletypewriter, but the serial interfacing remained.

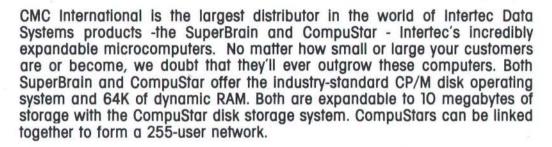
### Transmitting Over One Wire

The basis for serial data communications is the transmission of information over one wire. The interfacing techniques previously discussed all rely on several parallel wires to carry information between

# From CMC International, world's largest Intertec distributor...



# SUPERBRAIN and COMPUSTAR - YOUR CUSTOMERS WILL NEVER NEED ANOTHER SYSTEM!



Dealers benefit from the service and support offered through CMC. Like advertising co-op, software and hardware support, module replacement. And a toll-free line so you can call from anywhere in the continental United States.

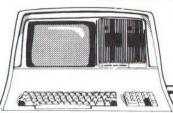
The bottom line is profitability. Our dealers benefit with a combination of quality intertec products and CMC international's pricing.

Contact us today. We deliver.



For Information Call (206)453-9777 To Order, Call Toll-free 1-800-426-2963

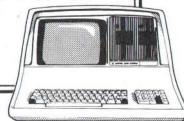
## CMC INTERNATIONAL



A Division of Computer Marketing Corporation 11058 Main Street, Suite 220 Bellevue, Washington 98004

**TELEX 152556 SEATAC** 

SuperBrain and CompuStar are registered trademarks of Intertec Data Systems Corporation CP/M is a registered trademark of Digital Research





DIRECTION

NAME

GUARANTEED LOWEST PRICES! To celebrate our opening, we are matching any advertised price. Just show us the ad

### ORDER TOLL FREE - Outside WI 1-800-826-1589

### **ACCESSORIES**

ı	pple II Dual Thermomete		w	s	of	tv	va	re									,
Ú	<b>Sountain Expansion Chas</b>	S	S		i										7	ï	î
	PS Multifunction												į.				
N	Mountain Music System.		+						į	i						÷	
1	00.000 Day Clock													į.	,		
	Mountain Clock		-							ì			ì		7	í	
	upertalker SD 2000		i.														
	/D + D/A				0	ì	Ė		ì	ì					9	-	
	CS 12K ROM/PROM Box	ari	ď	្	÷	ì	i.		i				Ü		ì		9
	CS A/D Converter Board																
	CS Serial Asynch, Board																
	CS Calendar/Clock Boar																
	OTRAX Type-n-Talk																
	DALAB Package																
	OS Dater																
	BT Numeric Keypad																
	BT Softkey																
	BT Barwand			ě.		Ī	ě	Š.		ě		Š	Č	Ž	Ġ		
	BT Cash Box																
	BT Pascal Tools I or II																
	citronic Remote Controll																
	citronic Energy Watcher																
	pple Speed Controller .																
	Applescope (your Apple a													1			
	cope Driver																
	idex Videoterm																
	idex Enhancer II																
	& D Enhancer																
	idex Character Sets																
	cho Speech Synthesizer																
	Ipper/Lower Character																
	ovsticks 4																
	LS Smarterm																
	LS Z-Card																
	SSM A10 s/p interface +																
	Scott Instrument VET (2)																
	ALF Music Card MC1 ALF Music Card MC16																
				0		٠	٠		*			,	+		٠	*	٠
	ALF Timing Mode 1/0		1.5	•	1		1	7	7		*		Ţ		٠		1
	ALF Albums																
	Aicrospeed II					٠	+							٠	+		۰

### AND MANY MORE!

Quoted prices valid for stock on hand and subject to change without prior notice.

Call for price information:

Printers - Epson, Okidata

Monitors - Amdek, Sanyo, NEC .

Modems - Novation, Hayes.

Disk Drives - Micro Sci. Corvus.

### Ask for our FREE catalog. For Software

see our other ad, page 447

- Please:

   Wisconsin residents add 4% sales tax
  - · Add \$2.50 for shipping per software and small item. Call regarding others

- Visa, Mastercharge (Add 4%) Checks (Allow 1-2 weeks for clearing) COD (Add \$1.50 per shipment)

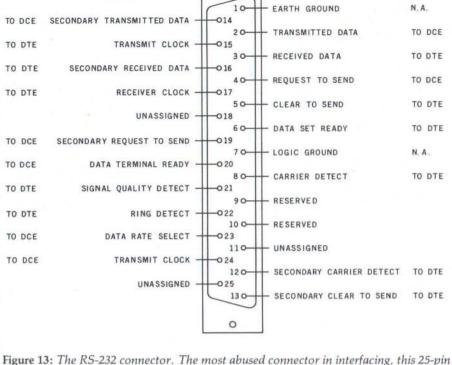
### TOLL FREE - Outside Wisconsin 1-800-826-1589

For Technical Info & in Wisconsin

715-848-2322

Orvx Software

205 Scott St., Dept. BB P.O. Box 1961 • Wausau, WI 54401



0

DIRECTION

subminiature D connector is used by most manufacturers for RS-232C interfacing. The terminal is supposed to use the male version of the connector, and the modem is to use the female version. Some devices use only pins 2, 3, and 7, while other devices use more pins. The reserved and unassigned pins have been used for anything from handshake signals to current-loop signal pins to power-supply pins. The RS-232C standard endorses none of these uses. The "Basic 8" pins are 1 through 7 and 20. If you manage to get these 8 pins connected correctly, the interface will probably work. Beware the phrase "standard RS-232C." The only standard is that advertising phrase.

devices; each wire carries a single bit of a character that is composed of multiple bits. When long distances separate a computer and its peripheral, the cost of running several wires in parallel becomes prohibitive. Serial interfacing provides a much less expensive solution.

Computer timesharing was born when computers became sufficiently powerful to handle several tasks simultaneously. Because computers were still very expensive, it was desirable to spread their cost over many users. But how were users at several locations to be connected to the central computing facility? Stringing wires to each location was too costly. Fortunately, the telephone system already had a suitable network of communications links.

However, these links were not limited to wires. Satellite and landbased microwave links also made up part of the phone system. Further-

more, all of these links were designed to carry voice, not computer data, and the phone companies winced at the prospect of finding all kinds of strange signals in their networks. Because teletypewriters did not have standardized interfacing requirements, the voltages involved could range from 6 to 140 V. A standard was required.

### The RS-232C Standard

The Electronic Industries Association (EIA) standard RS-232C was specifically designed to do one thing: to define the electrical characteristics for an interface between a piece of data terminal equipment (DTE) and a piece of data communications equipment (DCE). The DTE is the terminal for the timeshare user, while the DCE is a modulator-demodulator (modem) that encodes computer data into voice-like signals that are permissible on the phone system.

If you don't know a baud from a floppy...

### YOU NEED TO KNOW THE QDP-100 MICROCOMPUTER

Most people who need computers don't have the time, or desire, to become full-time computer "wizards."

With the budget-priced QDP-IOO you get all the time-saving precision information you want from a computer, now and in the future, without all the unnecessary complexity associated with less considerate computers.

ODP-100 IS A FULL-SCALE 8-bit computer, readily upgradeable to 16 bits as your business or professional information-processing needs grow. It uses the IEEE S-100 bus, compatible with CP/M and MP/M disk operating systems.

QDP-100 HANDLES BOTH floppy disks and hard disks to give you total software versatility.

QDP-100 CONNECTS INSTANTLY to any standard terminal and printer. Both serial and parallel ports are available. Features most microcomputers can't match.

It does more,
does it easier,
and costs a

ODP-100 HAS SINGLE BOARD
SIMPLICITY, Eliminates the hassle
of complex multi-chip, multiboard computers.
ODP-100 IS EASY to learn and to

nd costs a QDP-100 IS EASY to lear operate. Most owners QDP-100 with professional

operate. Most owners use their QDP-100 with professional skill and results in short order. Our instruction manual doesn't need an interpreter.

If you'd rather be a wizard with

computer results, than with computers, choose the QDP-100. Call or write for literature and full details.

QDP NEEDS A FEW MORE GOOD DEALERS.
Attractive, profitable, protected dealerships are still available in several high-potential computer market areas.

Quasar Data Products

10330 Brecksville Road Cleveland, Ohio 44141 216/526-0838 Telex: 241596

CP/M and MP/M are registered trademarks of Digital Research Corp.

Circle 352 on inquiry card.

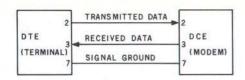


Figure 14: A minimal RS-232C link. A minimum of three wires is required to connect two RS-232C-compatible devices for bidirectional communication. Note that the DTE (data terminal equipment) transmits on pin 2 (transmitted data) and receives on pin 3 (received data). The DCE (data communications equipment) transmits on pin 3 and receives on pin 2. The signal names are from the DTE's perspective. Two DTEs or DCEs may communicate by cross-wiring pins 2 and 3. Some people think that is the normal way of connecting RS-232C devices, which shows how "standard" the standard is. Pin 7, the signal ground, is a return path for the signal current, and pin 1 is the earth ground. It's usually a good idea to connect the earth grounds between devices.

Figure 13 depicts the connector used with the RS-232C standard. Note that more than one wire is involved at this interface. Pins 2 and 3, the data-carrying wires, are called transmitted and received data. Pin 7 is a signal ground and serves as a current return path between the DCE and the DTE. These three wires are sufficient for bidirectional communications between the DCE and the DTE.

What are the other wires for, then? They serve as control wires between the DCE and the DTE and are there to establish and maintain a communication link with the computer. Let's ignore those other wires for now and examine the data lines more closely.

Common sense would tell you that the RS-232C standard allows data to be sent out on the transmitted-data line and received on the received-data line. Right? Wrong! Which device transmits on the transmitted data line, the DTE or the DCE? Both cannot transmit on pin 2 and receive on pin 3. If the DTE transmits on a wire, the DCE must have a receiver on that same wire, or there is no communication.

Note the difference between serial I/O and IEEE-488 (HPIB). The IEEE-488 standard specifies bidirectional data lines. RS-232C was developed earlier, and bidirectionality wasn't possible with the technology of the day. With just two data lines, it wasn't required either.

Which piece of equipment does transmit on the transmitted-data line? All signal names in the RS-232C standard are from the perspective of the DTE. Thus, the DTE transmits on pin 2 and receives on pin 3. The DCE transmits on pin 3 and receives on pin 2. Figure 14 should clear up any confusion about this.

Now to become confused again. Suppose you're going to connect a computer to a printer through the "standard RS-232C" port. Which device is a DTE, and which is a DCE? More specifically, which is going to transmit on pin 2 of the RS-232C connector, and which will transmit on pin 3? Neither the computer nor the printer is a terminal or a modem.

Manufacturers of these devices may offer cables which allow their equipment to look like either a DTE or a DCE. More often, however, the RS-232C connector is bolted to the back of the device, and no choice is possible. The manufacturer has had to make an arbitrary decision, one that will be wrong 50 percent of the time.

In the case of two devices of the same type, DTE or DCE, a haywire cable will have to be assembled to get signals onto the correct wires. Usually, this task falls to the user.

We have just jumped the first hurdle in connecting RS-232C equipment: physical plug-to-plug incompatibility. Many more potential problems are related to the data signal itself.

First, signal levels differ from those of the other interfaces discussed. RS-232C does not use TTL signals because TTL didn't exist when the standard was written. A positive voltage between 5 and 25 V is used to represent a logic 0 level on the RS- 232C data lines. A negative voltage between -5 and -25 V represents a logic 1 level.

These levels are true only for the data lines on pins 2 and 3; they are negative-true. All other signals in RS-232C are positive-true; therefore, a positive voltage represents a logic 1, and a negative voltage represents a logic 0. The same voltage levels are used; they just represent different logic levels.

Because the bits of a character are separated by time, a waveform is produced on the data line when a character is transmitted. Such a waveform for the transmission of the ASCII character "E" is shown in figure 15. The ASCII code for "E" is 1000101 in binary, and its least significant bit is transmitted first. The data line idles in the logic 1 state, and the waveform of figure 15 is read from left to right.

### Waiting for Start

For asynchronous serial data communications, a start bit is always sent first to mark the beginning of the character. (Synchronous data communications is different and won't be discussed here.) Following the start bit are the data bits in the character, sent in order from least to most significant. Each bit is held on the data line for a precisely controlled length of time called a bit time.

The receiver, which is alerted to the incoming character by the start bit, times the incoming signal and samples each bit as near to the center of each bit time as possible. Naturally, the transmitter and the receiver must agree on the length of time a bit will be held on the data line or the transmission will be garbled by samples made at incorrect times.

Bit time determines the maximum rate at which characters may be transmitted and thus defines the bit rate at which the RS-232C interface runs. Standard bit rates are 50, 75, 110, 134.5, 150, 300, 600, 1200, 2400, 3600, 4800, and 9600 bits per second (bps).

### Parity and Stop Bits

Following the data bits may be a parity bit, which is used for error

# MONITOR COMPATIBILITY. IT MAKES YOUR CHOICE CLEAR

All Electrohome Micro
Computer Monitors feature
the extra degree of engineering excellence you've
come to expect from all
Electrohome Electronic
products.

Our ECM 1302 series 13" RGB analog color Data Monitors offer the latest in advanced electronic technology and design innovation. Both the medium resolution RGB ECM 1302-1 and high resolution RGB ECM 1302-2 Monitors feature:

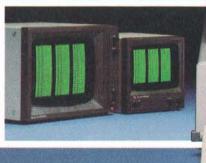
- 2000 character (80 x 25) display
- 16 rich, vibrant colors

- compatibility with the IBM PERSONAL COMPUTER as well as many other micros
- optional NTSC to RGB interface

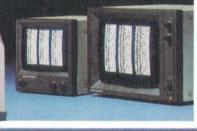
Our new EDM V26 Monochrome data display monitors are available with 9" or 12" screen sizes, white or green phosphor and feature:

- 18 MHZ bandwidth
- 2000 character (80 x 25) display
- 110/220 volts 50/60 Hz
- video loopthrough
- reduced scan adjustable All Electrohome monitors are backed by a nation-wide distribution and service network, feature a full one-year warranty, and are C.S.A. and U.L. approved. F.C.C. approval pending.

Whatever your system, make the clear choice. Electrohome Video Monitors deliver the performance you want at a price that's compatible with your budget.







# ELECTRONICS ELECTRONICS

ELECTROHOME LIMITED 809 WELLINGTON STREET NORTH, KITCHENER ONTARIO N2G 416

#### **Electrohome Distributors**

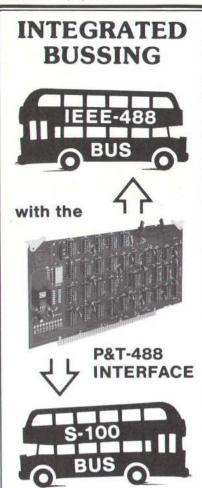
Consumer Computer Mktg. Inc., Sudbury, Mass (617) 443-5128 Components Unlimited Inc., Lynchburg, VA (804) 237-6286 EMES Systems Ltd., New York, NY (800) 223-1799 Anderson Associates, Bountiful, Utah (801) 292-8991 Anthem Systems Company, Burlingame, CA (415) 342-9182

Mycrosystems Distributors Inc., Dallas, Texas (214) 669-9370

Computerland, San Leandro, CA (800) 772-3545 (Ext. 118)

Outside California (800) 227-1617 (Ext. 118)

Fistor (What) Inc. Claudala California (010) 047 0047



Inexpensive S-100 computers can now communicate with the IEEE-488 instrumentation bus. The P&T-488 meets the IEEE-488 1980 standard for controller, listener, & talker.

Interface **software** allows simple communication with the 488 bus from Basic, Pascal and other high level languages. Interface software is available for CP/M®, North Star, or Cromemco.

Special features include an interactive **busmonitor** program and a functional self-test program.

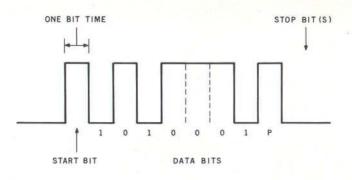
Price for (1) P&T-488 with software and 18" cable, assembled and tested: \$450 (domestic price) FOB Goleta, CA.



#### **PICKLES & TROUT**

P.O. BOX 1206, GOLETA, CA 93116 (805) 685-4641

\*CP/M is a registered trademark of Digital Research



**Figure 15:** The serial waveform. Serial information uses time to separate the bits of a message. This figure shows a 7-bit character being transmitted serially. A start bit goes first to signal the receiver that a character is coming. The start bit is always a 0 and is followed by the 7 data bits, transmitted from the least significant to most significant bit. The character shown being sent is 1000101, which is the ASCII code for "E". The data bits are followed by an optional parity bit for error checking, then 1 or 2 stop bits which are always 0. The stop bits serve to separate the characters and to give the receiver time to finish assembling a character before the next one starts coming in.

detection. A noise pulse could affect the data line at the wrong time, causing a bit in the transmission to be misread. If the transmitter keeps track of the number of 1s in the character being transmitted, it can set the parity bit so that the total number of 1s is always even (for even parity) or odd (for odd parity). The receiver can also keep track of and use the parity bit to determine whether the transmission was received in error. Parity is useful for detecting single-bit errors. If more bits are affected, parity might not detect the error.

The last bits to be transmitted are the *stop bits*. These are not really bits but stop times to allow the receiver time to assemble the serial bits just received, send the assembled character on, and prepare for the next character. There may be 1, 1.5, or 2 bit times allowed for stop bits. Since this is a rest period, "fractional bits" are allowed.

#### Picking Up the Pieces

Now, given the format of the data transmission, what could possibly go wrong? First, the transmitter and receiver must agree on several parameters. The bit rate has been mentioned already. In addition, the parity (odd, even, or none) and the number of stop bits must be set the same in both transmitter and receiver.

Character codes must also be con-

sidered (more on these next month). Our example uses the ASCII character set with 7 bits per character. ASCII is the most popular code in use today, but 5-bit codes (Baudot and Murray), 6-bit codes (IBM Correspondence Code), and 8-bit codes (IBM EBCDIC) also exist. The RS-232C standard does not restrict the number of bits per character.

After connecting the computer and printer so that they use the proper wires and agree on bit rate, parity, number of stop bits, and character code, you may feel that this interface is licked. Not so.

Suppose the printer is set up for ASCII 7-bit characters, odd parity, and 1 stop bit. In addition, the bit rate is set to 9600 bps. Well, that's fine. I've set the bit rate to the fastest rate so that the equipment doesn't waste a lot of time sending characters and the printer will be used at its maximum speed. Assume that the computer side of the interface has been set compatibly.

Now I'll write a program on the computer to send one line of text to the printer to be printed, being careful to put lots of comments in the program so I can remember what I did. The program works! I then list the program on the printer to have a record of my triumph. Unfortunately, several characters seem to have been lost in the transmission. I try again with equally dismal results. Running the program meets again

# TAKE A TEST DRIVE.



Systems available for Altos, 'Apple,™ Atari,™ Heath,™ North Star,™ S-100, ²TRS-80, (Models 1, 11, 111, Color), Zenith.

EAST

CMD Performance

Windsor, Ct......(203) 688-3862

Digital Data Communications, Inc.

Richmond, Me.....(207) 737-4447

MIDWEST

Cottage Software

Wichita, Ks.....(316) 683-4811

Web Products, Inc. Software Division

Carol Stream, Il.....(312) 653-5229

Meta Technologies 1-800-321-3552

Insync Systems Corp.

Alvin, Tx.....(713) 331-2024

Central Kansas Computers

Herrington, Ks.....(913) 258-2575

Dataflow Systems

Indianapolis, In.....(317) 888-3640

WEST

**Everett Computer Center** 

Everett, Wa.....(206) 259-0024

Connection 80

Vancouver, Wa.....(206) 573-0319

H & S Microsystems

Burnaby, BC Canada......(604) 430-4145

COMPUTER CORPORATION

Dealer Inquiries — 1-800-621-3102, (312) 987-1024



Circle 86 on inquiry card.

### INTELLIGENT PRINTER INTERFACE

Free Your Computer from the Mundane Task of Printing



Imagine being able to use your computer seconds after beginning an extensive printout.

Visualize your printout with page breaks, page numbering and titles, margins of your choice, indented carryover lines, on any size paper!

Appreciate the time and money you will save by not waiting for your printer.

SooperSpooler, a buffered printer interface, maintains control over your printer while you go on using your computer for more productive activities. Eliminate waiting while your printer pecks through a long document. SooperSpooler accepts information from your computer at up to 3000 characters per second and feeds it to your printer as fast as it can handle it—without using any of your computer's memory or time!

#### SooperSpooler features include:

- 16K Memory (62K optional)
- Buffer Status Readout
- Space Compression
- Pagination
- Single Sheets
- · Headers and Page Numbering
- · Indentation on Carryover Lines
- · Self Test Routine
- · Features also Software Controllable
- Plugs into Most Computer Systems
- \* 16K Parallel I/O Unit-\$349.00!
- \* Serial I/O Option-\$95.00
- \* 46K Memory Option-\$159.00

SooperSpooler by Compulink—
The missing link that gives your
microcomputer mainframe printing.

### COMPULINK

1840 Industrial Circle Longmont, CO 80501 (303) 651-2014

Send for brochure
Dealer inquiries welcome
Call for information: 800-525-6705

with success and listing again fails. What is going on?

#### No Handshake Today

First, let's consider the data rate at which the computer is sending characters. ASCII uses 7 bits plus 1 for the parity bit, 1 for the stop bit, and a start bit, for a total of 10 bits per character. The computer is sending 9600 bits per second, which is equivalent to 960 characters per second.

A quick look at the printer specifications reveals the problem. The printer can print a maximum of only 175 characters per second. We are sending data to the printer five times faster than it can print! Most printers

The success of a handshake mechanism in an RS-232C interface cannot be predicted without studying manuals for both of the devices involved.

have buffers and can tolerate this mismatched data rate until the buffer fills. After that, any subsequent characters transmitted will fall on the floor! Running my program required transmitting less than a buffer full of characters. Because the buffer didn't overflow, there was no problem. Listing the program on the printer, however, required sending more characters. When the buffer overflowed, characters were lost.

Other interfaces have handshake mechanisms to prevent data transmitters from going too fast for their receivers. Surely, RS-232C also has a handshake mechanism to prevent this problem? Nope. Returning to figure 13, let's now consider the other RS-232C signals and try to find some to use as a handshake mechanism. Look in particular for two sets of handshake lines: one for the transmitteddata line and the other for the receivedata line.

Aha! Pins 4 and 5 are called Request to Send and Clear to Send.

These certainly look like prime contenders for handshake lines. Unfortunately, many printer manufacturers have also fallen into this trap. The names of the signals on pins 4 and 5 do indeed lead you to believe that they form a data-handshake mechanism. According to the strict RS-232C definition, the DTE asserts Request to Send when it has data to transmit. It then waits for the DCE to assert Clear to Send before transmitting. That's half of the traditional handshake. The problem is that the DCE is not allowed to drop Clear to Send until the DTE drops Request to Send.

#### Take a Long Drink

This situation is similar to taking a drink from a garden hose with a friend controlling the spigot. It's easy to start the flow, but you'd better be prepared to take either a long drink or a short shower.

The DTE and DCE signals on pins 4 and 5 were intended as a handshake between the terminal and the modem (remember those?) to allow the terminal to request control of the communications link from the modem. They also make it possible for the modem to tell the terminal when the link has been acquired. The terminal is then allowed to assume that it will keep the link as long as it wishes. Thus, the DCE cannot arbitrarily drop Clear to Send whenever it wishes.

Request to Send and Clear to Send are indeed handshake lines. Unfortunately, the DTE and the communications link are handshaking, not the DTE and the DCE. Also, this handshake is on a message basis, not character by character. Use of pins 4 and 5 of the RS-232C connector can result in success but usually results in a spectacular failure.

Some manufacturers have ignored the strict definition of pins 4 and 5 and use them for a data handshake anyway. Others avoid the conflict by using the Data Terminal Ready or Data Set Ready lines (depending on whether they are emulating a terminal or a modem). None of these lines was intended to be used for data handshaking. Use of any RS-232C line for handshaking does not

# **Move Up to Tarbell**



### The Serious Business Machine

Do you have a small computer system that operates with mini-floppies and has limited storage capacity? Then it's time to move up to the Tarbell Empire Series System. Tarbell starts where small systems leave off, providing storage from 1 to 20 megabytes. This means Tarbell is capable of growing right along with your business. (It also makes sense to start with Tarbell if you're a first-time computer buyer.)

Tarbell is the serious general purpose business machine, backed by years of experience with disk systems. It gives you word processing, inventory control with bill of materials, mailing lists — all in addition to accounting applications: general ledger, payables, receivables, payroll with cost accounting and order entry. Whatever your need may be, Tarbell can provide the working software that gets the job done.

With the Tarbell System you get a Z80 4 Mhz CPU with memory management, timer and full interrupt capability, 2 RS-232 serial ports with handshaking, 64 K bytes of random-access memory, double density floppy disk interface, 2 double density floppy disk drives, cabinet, power supply, and cables.

The software includes: CP/M™ 2.2 disk operating system, Tarbell Disk BASIC, Tarbell Database System, and all manuals and documentation.

Tarbell also offers the MP/M™ Multi-User Operating System and 4 additional RS-232 serial ports.

The Tarbell Empire Series is delivered assembled, tested, and with a FULL six-month warranty on parts and labor.

And when you need even more mass storage, Tarbell also has a hard disk that's systemcompatible and provides easy back-up.

If your business is growing or you need more than a few hundred K bytes — it's time to move up to Tarbell. Call your local Tarbell dealer for competitive prices.

Jarle W

The One-Stop Shopping Service

950 Dovlen Place, Suite B Carson, CA 90746 (213) 538-4251 guarantee recognition of the handshake by the device at the other end of the cable.

Consider other possibilities of using Clear to Send as a handshake line. If a device drops Clear to Send in the middle of a character transmission, what does that mean? If the transmitter stops immediately, in the middle of the character, that character is sure to be garbled because timing is important in serial communications. If the transmitter waits until that character transmission is complete and then stops, there may be no room in the receiver's buffer for that last character transmitted.

Because this possibility is not considered in the standard, the success of a handshake mechanism in an RS-232C interface cannot be predicted without studying manuals for both of the devices involved. Sometimes even studying the manuals doesn't help.

#### Back to the Beginning

Finally, consider the device that started this discussion, the teletypewriter. The RS-232C standard at least defines a connector pinout and signal levels. No such standards exist for teletypewriters. The serial transmission format is the same, with start

The RS-232C standard defines the electrical characteristics for an interface between a piece of data terminal equipment (DTE) and a piece of data communications equipment (DCE).

and stop bits, data bits, and parity

The signal interface uses a technique called current loop. Instead of positive and negative voltages representing logic 1s and 0s, current loop uses presence or absence of current. Presence may be either 20 or 60 milliamperes, depending on the teletypewriter model. No standard connector or standard pinouts exist for current-loop operation.

Despite all these problems, designers of serial interfaces for computers strive to include current-loop capabilities in their interface designs. Where RS-232C is limited to a 50-foot cable (an often-violated part of the standard), current loop can be run much farther. In addition, the current-loop interface has been around for a long time, and several devices other than teletypewriters use this interface. Finally, teletypewriters remain a cost-effective solution as a combination printer and terminal.

#### Handle with Care

As you can see, serial interfacing needs to be approached more carefully than other hardware interfacing techniques. The "standard RS-232C" nomenclature persists in specification sheets even though most uses of the interface are far from standard.

As technology progresses, serial interfaces become more adept at covering an ever-widening range of hardware. Unfortunately, this still doesn't guarantee an efficient interface in every application because serial I/O remains the unstandard interface.

I've now discussed the four basic interfaces: parallel, IEEE-488, BCD, and serial. Without these interfaces, the computer systems we all know and love wouldn't be able to do much useful work.

Next month I'll examine the character codes used for data transmission. Character codes are another major source of incompatibility in computer communications. I'll discuss the problems presented by different character codes and how today's software strives to cope with incompatibilities.■

See a Byte Future for the NEC PC-8000 Series with the REN TEC WEDGE ★ Emulates all features of the NEC PC-8012A I/O Unit 32K RAM card included, expandable to

64K RAM = 96K of RAM

★ Two Atari™-type joystick ports

Attaches easily to the bottom of the PC-8000

★ NEC PC-8001A SI/O channel brought out to a DB 25 connector 32K Memory Board . . . . . . . . . \$199

\* Built-in 3-voice synthesizer

\* NEC PC-8012A bus structure is implemented

The REN TEC WEDGE ....\$595 KONAN<sup>TM</sup> Hard Disk Also Available

RS-232-C Interface Card . . . . . \$179 RGB to Composite Video .....\$149 (40 column only) . . . . . . . . . \$295 Speech Synthesizer

REN TEC Peripherals for PC-8000

#### Olympia Letter-Quality Printer with REN TEC ES INTERFACE

\* Converts Olympia typewriter to letter-quality printer ★ Easy installation using existing ES100/101/105 cables ★ Accepts RS-232-C serial. Centronics parallel, and IEEE-488 ★ CMOS logic for minimal drain on power supply \* Selectable auto. line feed \* Programmed wait possible \$295 Commodore slightly higher

THE PLACE for Technical Awareness DEALER INQUIRIES WELCOME

#### RENAISSANCE TECHNOLOGY CORPORATION

3347 VINCENT ROAD, PLEASANT HILL, CA 94523 • (415) 930-7707

Steve Leibson has written a booklet called "Computer Input/Output Course," published by Instruments & Control Systems, Chilton Way, Radnor, PA 19089. Price of the book is

# Getting rave reviews from the boss may be the best reason to switch to Opus.



Buying products that perform well is one of the yardsticks by which your own performance is measured. So we make sure you take center stage just as soon as we get in on the act. For starters, we guarantee the performance of our products. As well as 48-hour delivery turnaround time. We back you with quality second to none in the industry. And with personal service. So call 800/321-9330 to get our entire supporting cast on the scene. Or write to Computer Resources, Inc., 4650 West 160th Street, Cleveland, OH 44135.





 $\label{eq:Quality Flexible Diskettes, Single-Disk Cartridges, Multi-Level Disk Packs, and Magnetic Tape.$ 

Circle 99 on inquiry card

#### SOFTWARE CP/M®

### SOFTWARE CP/M®

#### SOFTWARE APPLE®

#### HARDWARE **PRINTERS**

SORCIM

ASHTON-TATE

VISICORP

**FPSON** 

SUPERCALC . . . . . . . . . 209.00

dBASE II VERSION 2.3A . 529.00 DATA BASE MANAGEMENT SYSTEM AVAILABLE IN MANY FORMATS.

VISICALC® APPLE DOS 3.3......190.00 List: 250.00

......729.00 MX-100 List: 995.00 MX-80 FT with

THE MICROHOUSE

VISICALC® IBM 64K .... 158.00 List: 200.00 FOX&GELLER

List: 795.00

"ddQ" PACKAGE: . . . . 699.00 ASHTON-TATE's dBASE II FOX & GELLER's dUTIL and QUICKSCREEN

List: 924 00

QUICKSCREEN.....129.00 dUTIL.

VISICALC® IBM 256K ... 190.00 List: 250.00

MX-80 FT......549.00 List: 745.00 MX-80 with GRAFTRAX . . 479.00

List: 99.00

......190.00 VISIDEX List: 250.00

List 645.00 8141 SERIAL INTERFACE. 64.00

MICROSOFT

VISIPLOT . List: 200.00 VISITERM . . . . . . . . . . . . . 79.00 List: 100.00

8150 SERIAL INTERFACE . . . . . . . . . . . 140.00 WITH 2K BUFFER 8151 SERIAL

........ 155.00

BASIC 80 ..... 285.00 BASIC COMPILER ..... 315.00 COBOL 80 . . . . . . . . . . . 568.00 FORTRAN 80 ..... 345.00 muSIMP/muMATH.....215.00

VISITREND......249.00 List: 300.00 VISIFILE . . ......... 190.00 List: 250.00

WITH 2K BUFFER AND Xon/Xoff PROTOCOL 8230 APPLE® CABLE . . . . 24.00 PARALLEL

MACRO 80 ......140.00 LEXISOFT

DESKTOP PLAN II..... 190.00 List: 300.00 DESKTOP PLAN III . . . . . 149.00 List: 250.00

8131 APPLE® INTERFACE . . . . . . . . . . . 63.00 PARALLEL

SPELLBINDER..... 299.00 List: 495 00

List: 700.00

VISIPACK: ......... 599.00 INCLUDES VISICALC. VISIFILE, & VISITREND VISIPLOT List: 700.00

**GRAPPLER INTERFACE** AND CABLE: ..... 125.00 FOR APPLE®, MX-80 (MUST have Graftrax), MX-80 FT, MX-100, IDS PAPER TIGERS AND C. ITOH PROWRITER

INTERFACE ...

### Microhouse continues to feature the best savings on the best software.

	MICROPRO
	293.00
List: 495.00	

HAYDEN PIE Writer . . . . . . . . . . . . . . . . 124.00 APPLE" WORD PROCESSOR List: 149 95

APPLESOFT COMPILER, 145.00

PRISM PRINTER 132... 1699.00 List: 1995.00 PRISM PRINTER 80 . . . . . 799.00 List: 895.00 PAPER TIGER 560G ... 1149.00

WORDSTAR FOR IBM ... 289.00 List: 495.00 SUPERSORT ..... 168.00 MAILMERGE ..... 103.00 DATASTAR......235.00 CALCSTAR ...... 199.00

List: 295.00

MICROSOFT TIME MANAGER . . . . . . . . 125.00 List: 150.00 TASC APPLESOFT COMPILER. 150.00

FORTRAN 80 ..... 165.00

COBOL 80......550.00

OKIDATA MICROLINE 84 . . . . . . . . 1199.00 MICROLINE 83A..... 749.00 MICROLINE 82A..... 499.00

ACCESSORIES APPLE

A.L.D.S. . . . . . . . . . . . . . . . . 105.00 MICROPRO

MICROLINE 80 . . . . . . . . 365.00

VIDEX

APPLE

WORDSTAR.....234.00 List: 375.00 CALCSTAR ..... 149.00

C. ITOH PROWRITER PARALLEL . 499.00 List: 845.00 PROWRITER SERIAL .... 650.00

VIDEOTERM ..... 290.00 KEYBOARD ENHANCER, 105.00

MODEMS NOVATION

List: 885.00 F-10 PARALLEL . . . . . . . 1560.00 F-10 SERIAL ..... CALL

MOUNTAIN 

APPLE® -CAT ..... 325.00 List: 389.00 AUTO-CAT......213.00 

COMET I..... 295.00 List: 495.00 STARWRITERI PARALLEL......1450.00

MICROSOFT PREMIUM SYSTEM:.... 619.00

HAYES CHRONOGRAPH ..... 199.00 List: 249.00 SMARTMODEM ..... 227.00

MICROMODEM II . . . . . . . 299.00

STARWRITER II 

List: 1895.00

List: 1960.00

List: 2325.00 STARWRITER II SERIAL......1800.00 List: 2025.00

STARWRITER I SERIAL . 1500.00

INCLUDES: Z-80 SOFTCARD, 16K RAMCARD VIDEX VIDEOTERM, and CP/M USER GUIDE

Z-80 SOFTCARD ..... 299.00 16K RAMCARD......150.00

List: 775.00

Circle 277 on inquiry card.

#### TO ORDER

THE MICROHOUSE ORDER CENTER IS OPEN 9:00 AM - 8:00 PM EASTERN TIME MONDAY THROUGH FRIDAY.

CALL TOLL-FREE FOR ORDERS, PRICE QUOTES, AND AVAILABILITY

#### 1-800-523-9511

IN PENNSYLVANIA, AND FOR TECHNICAL SUPPORT:

1-215-868-8219

#### MICROLINE:

MICROHOUSE OFFERS 24 HOUR COMPUTER SHOPPING WITH MICROLINE. MICROLINE IS A COMPUTERIZED ORDER-ENTRY SYSTEM, SIMILAR TO ACCESSING TIME-SHARING SYSTEMS. MICROLINE ENABLES YOU TO ACCESS SPECIFIC INFORMATION ON OVER 1000 MICROCOMPUTER HARDWARE AND SOFTWARE PRODUCTS, IN ADDITION TO NUMEROUS SUPPLIES AND ACCESSORIES.

MICROLINE GIVES YOU THE OPTION OF ORDERING AS MUCH AS YOU WANT, AS OFTEN AS YOU WANT. MICROHOUSE WILL PROCESS YOUR ORDER WITHIN 24 HOURS.

1-215-868-1230

MICROLINE OPERATES AT 300 BAUD, 8 BITS, NO PARITY, 1 STOP BIT.

#### SHIPPING:

ADD 2% TO ALL ORDERS. DIFFERENCE WILL BE CREDITED. OUTSIDE CONTINENTAL UNITED STATES ADD AN ADDITIONAL \$5.00.

ALL ITEMS SHIPPED UPS GROUND. OTHER SHIPPING METHODS AVAILABLE UPON REQUEST.

#### PAYMENT:

ACCEPTED PAYMENT BY PERSONAL CHECK, MONEY ORDER, C.O.D., MASTERCARD, OR VISA. PURCHASE ORDERS NEED PRIOR APPROVAL.

MICROLINE PAYMENTS BY PERSONAL CHECK, MONEY ORDER, C.O.D., MASTERCARD, OR VISA ONLY

PENNSYLVANIA RESIDENTS ADD 6% SALES TAX.

MICROHOUSE 1444 LINDEN STREET P.O. BOX 498 BETHLEHEM, PA 18016

PRICES AND SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE.

ALL ITEMS SUBJECT TO AVAILABILITY.

SUPERCALC is a trademark of SORCIM.
VISICALC, VISIDEX, VISIPLOT, VISITERM,
VISITREND, DESKTOP PLAN, and VISIFILE
are trademarks of VISICORP.

QUICKSCREEN and dUTIL are trademarks of FOX & GELLER ASSOC.

SOFTCARD, RAMCARD, TIME MANAGER, and PREMIUM SYSTEM are trademarks of MICROSOFT.

WORDSTAR, SUPERSORT. MAILMERGE, DATASTAR, SPELLSTAR, and CALCSTAR are trademarks of MICROPRO INTERNATIONAL.

dBASE II is a trademark of ASHTON-TATE. SPELLBINDER and SPELLCHECK are trademarks

of LEXISOFT.
MICROMODEM II is a trademark of HAYES
MICROCOMPUTER PRODUCTS, INC.

PRISM is a trademark of INTEGRAL DATA SYSTEMS, INC.

APPLE is a registered trademark of APPLE COMPUTERS.

CP/M is a registered trademark of DIGITAL RESEARCH. Microhouse has it. MicroPro's WordStar for IBM: \$289

### Microhouse

### **NEW**FOR APPLE HAYDEN

### PIEWRITER

Yes, that's right. Another word processing system for the Apple II. So, what makes the Hayden PIEWriter so different? Well, for one - the price. Secondly - you need not purchase any additional hardware for your computer to make it operational.

PIEWriter has the ability to do incremental spacing so that fractions of a space can be added between words when justifying text. This makes the distribution of the space required to fill out a justified line more uniform and less noticeable. In addition, with its optional proportional spacing formatter program, PIEWriter becomes the ONLY word processor that can print true proportionally spaced documents.

Versatility and compatibility are two important features of PIEWriter. While some word processors for the Apple II computer will only work with specific accessories, such as 80-column display boards, lowercase adaptors and printers, PIEWriter is versatile enough to work with almost any combination of these. If you have any one of these hardware accessories in your system, Hayden has a PIEWriter for your particular configuration.

### NEWFROMIDS PRISMPRINTER

The Prism Printer is the first truly modular, field-upgradable dot matrix printer. Now your printer can be as flexible as the rest of your system.

No other printer offers you as much - or as little - as you need. Start with the basic printer which features text quality printing; then add the performance modules you need-when you need them. Getting into word processing? Add the automatic cut sheet feeder. Handling lots of data? Install the high speed Sprint Mode. Want to get the big picture? Add the Dot Plot graphic option. And for communicating information and ideas faster, nothing is more effective than Prism Color for high quality, multi-color output.

And that's just the beginning. Additional Prism option modules will soon be available to help your evolving system meet its true potential.

If you are an Apple, IBM, or other professional microcomputer user, Prism Printer is the key to your total system solution. At last, the chemistry is right between you and your printer.

Microhouse offers both the Prism 80 and Prism 132 Printers at great savings. Please call for availability.

### **Software Review**

## Alien Typhoon

Walt Latocha 5328 South Narragansett Chicago, IL 60638

In the history of arcade games, Space Invaders has been an enduring favorite, as the number and popularity of its descendants will attest. The Bally Company's coinoperated version of Space Invaders was a fantastic success, and when the initial popularity of the game started to fade, the company introduced an improved version, Deluxe Space Invaders. Later, Bally improved upon the basic motif once again to produce Galaxian—the most difficult variation on the Space Invaders theme.

Galaxian's popularity was somewhat eclipsed by the Asteroids craze; nevertheless, Galaxian, like other popular arcade games, was favored enough to be copied for the home-computer market.

One of the first of the Galaxian clones was Broderbund Software's Alien Rain. After great success with that game, Broderbund has issued a more challenging version named, appropriately, Alien Typhoon.

In Alien Typhoon, as in Space Invaders, you control a gun that appears on the bottom of the screen. You can move the gun and fire it either by keyboard input or by a paddle controller. Above the gun hangs a constantly moving swarm of up to forty-six alien spacecraft.

Alien Typhoon differs from Space Invaders in that the aliens don't march down the screen in orderly ranks; rather, the ships peel off from the main cloud and divebomb your gun in groups of one to ten ships at a time.

As in Space Invaders, the aliens can attack and destroy your gun with gunfire of their own, but you face an added hazard when a spacecraft uses a ramming maneuver to demolish your gun. You have only two defense options—shoot the alien craft or get out of its way when it comes swooping down.

You are initially allowed three guns per game. If you earn a total of 5000 points (scored by destroying the alien ships that, depending on their types, have various point values) you are awarded a fourth weapon.

Documentation for the game is nonexistent (the only thing that comes close is a warning on the disk's package that reads, "For Fanatics Only!! Twice as many, twice as fast, and twice as tricky!"). However, the lack of documentation doesn't handicap this easily understood game.

But there is absolutely nothing lacking in the game's graphics, which take full advantage of the Apple's resources. Beautiful color increases the excitement as the enemy craft swoop, bank, loop, and curl across the screen. In fact, the graphics are one of the major tactics that the computer uses in the game. Often a player will find himself bedazzled by the wild gyrations of one particular alien craft while another beelines in on a suicide run. The graphics alone make Alien Typhoon worth buying, and the game's sound effects are adequate and give proper emphasis to the mayhem on the screen.

As far as difficulty is concerned, I recommend that you take heed of the warning on the package. This game offers plenty of challenge—perhaps too much for some players. As a rule of thumb, if you haven't mastered Space Invaders or an equivalent game, think twice about purchasing Alien Typhoon.

#### Conclusion

Alien Typhoon is a fast-action, sophisticated, arcadetype game with exceptional color graphics. The game requires great skill (more, in fact, than Galaxian, the original coin-operated game on which it is based), but if you have the required aptitude, the game should hold your interest for hours.

#### At a Glance

#### Name

Alien Typhoon

#### Type

Arcade-style game

#### Manufacturer

Broderbund Software Inc. 1938 Fourth St. San Rafael, CA 94901 [415] 456-6424

#### Price

\$24.95

#### Author Tony Suzuki

\$24.95

#### Format

51/4-inch floppy disk

#### Language

6502 machine language

#### Computer

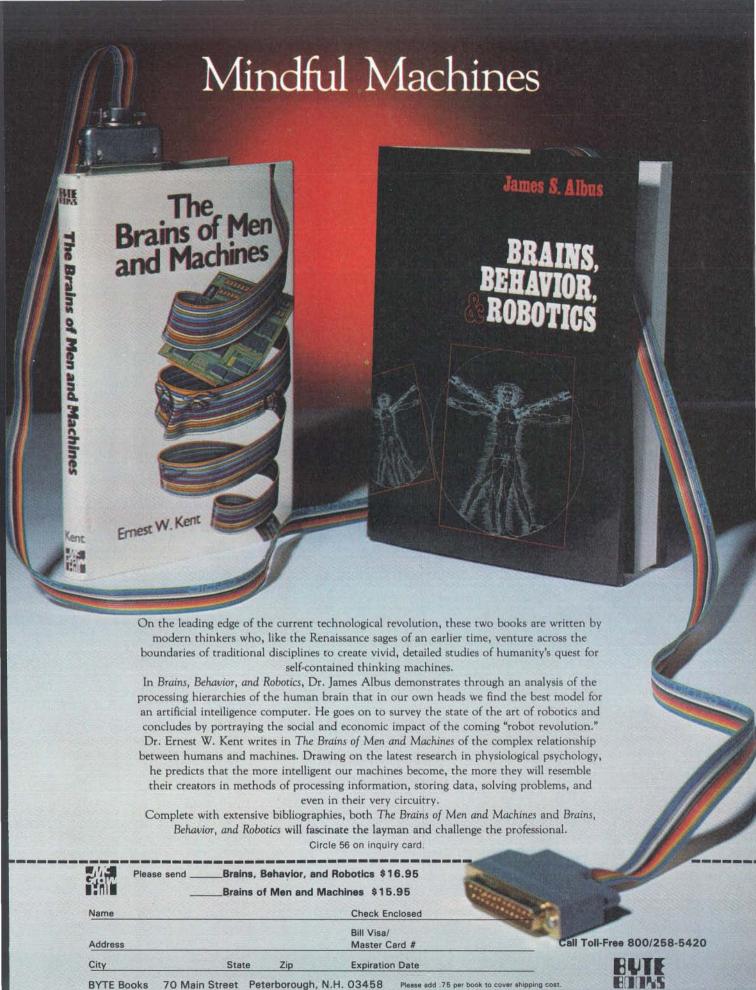
Apple II or Apple II Plus with one disk and 48K bytes of memory

#### Documentation

None

#### Audlence

Experienced game players



В

### **User's Column**

## Supercalc, Spelling Programs, BASIC Compilers, and Home-Grown Accounting

A critical computer user surveys new programs, including one of his own.

> Ierry Pournelle c/o BYTE Publications POB 372 Hancock, NH 03449

"There may not be a lot of really new software," I said to my mad friend, "but there's a lot of good stuff coming out."

"What do you have in mind?" he asked.

"Well, there's Sorcim's Supercalc. I really like that one. Whatever you'd like to do with scratch-pad math, it'll do it, and simply. I've got two different versions, one on 51/4-inch disks for the Osborne 1 and another on 8-inch disks for the Godbout. And I love them both."

Which I do. One of the nicest things about Supercalc is the documentation, although it looks a bit formidable when you first open it (there are a lot of pages there). But on inspection it really tells you a lot about how to use the program. Neither I nor

my assistants had any difficulty learning to use the program because there is not only complete program documentation, but also good Help instructions.

#### CB80 has all the advantages and disadvantages of CBASIC-2.

"But there's no index," my mad friend said. "Mark 'em down. Tell the world. Dammit, there's no excuse for software without indexed documents."

A sentiment I thoroughly share, but Sorcim has an excuse for this one. Supercalc is so darned easy to use, once you get the hang of it, that the

on-line Help files, plus the handydandy little "AnswerCard" that comes with it, are all you really need; most of the documentation is a tutorial, not a reference guide. Me, I think I'd have designed the documents slightly differently, with an indexed reference work appended to the tutorial; but that's a mild preference. Certainly you can learn Supercalc from what Sorcim supplies.

It's worth learning, too. Like dBase II, Spellguard, and WRITE, Supercalc is destined to become a classic, a program that does what it says it will do with very little fuss and bother.

What Supercalc does is calculate. It is, of course, a Visicalc "work-alike," designed to work on 8080/Z80 CP/M systems. Imagine a big work sheet spread out in rows and columns of

# NGW. OASIS-16: STRICTLY BUSINESS.

The 16 bit operating system designed specifically for business micro-computing. Application software?—it's here, NOW!

OASIS-16\*: the operating system designed for business. Not just a hobby or development system rewritten for business use, it is the natural evolution of OASIS\*\*: the multi-user system with a world-wide reputation as *the* standard for those who take business seriously.

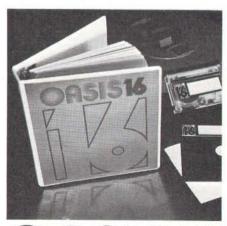
And here's more good news: there's no waiting for application software because what now runs on OASIS is upward compatible to run on OASIS-16. That means plenty of proven software, available immediately.

OASIS-16 puts it all in one package. For manufacturers: one source for operating systems, languages, tools; custom implementation to maximize hardware potential; international support & training; flexible licensing agreements. For software developers: complete portability keeps application software machine independent; integrated tool set makes development easier, faster. For end-users: user-friendliness; data security; portability simplifies system expansion; plus an extensive application software library.

Computing professionals have long told us 'OASIS makes micros run like minis'—with OASIS-16, it's truer than ever. And that's strictly good business.

\*For 8086, 68000, Z8000, LSI-11, & others. \*\*For Z80.

THE OASIS-16 PACKAGE CONTAINS: Operating System; EXEC JCL Language; Editor; Script Output Text Formatter; Assembler; Linkage Editor; Diagnostic & Conversion Utilities; BASIC Interpreter & Compiler; 'C' Compiler.



OF STRICTLY BUSINESS

FEATURES: File & Automatic Record Locking; Logon, Password & Privilege Level; User Accounting; Re-Entrant BASIC Interpreter & Compiler; ISAM, Keyed, Direct & Sequential Files; and more. Plus some of the best, most extensive documentation in the industry.

OPTIONS: COBOL: PASCAL; FORTRAN; RDBMS; 2780/3780 Bisync; Networking; and others.

#### PHASE ONE SYSTEMS, INC.

7700 Edgewater Drive, Suite 830 Oakland, CA 94621-3051 Telephone 415/562-8085 TWX 910-366-7139

I'm serious about my business please send me quick:

- ☐ OASIS-16 Manual, \$75
- ☐ OASIS Manual, \$60
- ☐ Free Application Software Directory and put me on your mailing list.

and put me on your mailing list. (Add \$3 for shipping, California residents add sales tax.)

Name\_\_\_\_\_St. (No Box#)\_\_\_\_\_

City\_\_\_\_\_ State\_\_\_ Zip\_\_

☐ Check enclosed ☐ UPS C.O.D.

☐ VISA ☐ Mastercharge

Card No. \_\_\_\_\_ Exp. date \_\_\_\_\_ Signature \_\_\_\_

cells. Now imagine that into any cell you can enter any darned thing you want: a number, a label such as "sales tax" or "horsefeathers," or perhaps a formula such as "the sum of the five cells above this one." Another formula might be "the average of all the cells in the next row" or "the square of the cell above divided by pi." Finally, imagine that as soon as you enter a number that affects any cells in which you have formulas, the values, no matter how complex, are instantly recalculated and displayed.

That's Supercalc. Not only does it do all the above, but there are really nifty edit features that make it easy to get at the cells you want to work on; and you can save your work in a disk file at any time. I imagine the IRS is going to just hate Supercalc and all the programs like it; it will now be relatively easy to calculate your taxes in every conceivable way and choose the one you like best. The nicest part about it, too, is that if you use your computer to do your taxes, it's likely to be deductible-certainly the software is.

Sorcim is a thoroughly professional software company that also supplies the basic input/output system (BIOS) for the Godbout 8085 computer; and therein lies an instructive tale.

Supercalc has an installation program that lets you tell it what terminal you're using. Supercalc likes a half dozen or so terminals and will tolerate a few more. One that it likes is the Zenith Z-19, which is good because that's what I've connected to my new Godbout 8085/88. The Z-19 has a standard 24 lines of 80 columns, plus a special 25th status line that can't be got at without special programming. Supercalc uses the special programming to give some helpful information.

The Z-19 also has a row of specialfeature buttons that send an escape sequence-that is, the character "escape" (1B hexadecimal) and then a number or letter. Supercalc catches these and uses them to do nifty things like controlling the cursor and displaying Help files.

Unfortunately, the package I received from Sorcim didn't quite do that. There appeared on the 25th line a message that the "red square" special-purpose button was the "Help" button and that the "blue square" button would toggle the special shift to turn the numeric keypad into cursor controls; but in fact neither the red nor the blue button did anything at all, and trying to use the shift feature on the numeric keypad produced weird results that nothing seemed able to fix.

So now what? I sent a note to Richard Frank, president of Sorcim, and a few days later got a phone call from one of Sorcim's engineers. Other Z-19 terminals worked with Supercalc, so it wasn't the program. A few tests carried out during the phone conversation produced even stranger results: the terminal was operating well, but the computer wasn't receiving the escape sequences

#### ★ ★ FEATURING 8 and 16 BIT S-100 SYSTEMS ★ ★ ★

WE OFFER A WIDE RANGE OF CRTs, PRINTERS, GRAPHICS EQUIPMENT, SOFT-WARE FOR ALL SYSTEMS. EACH SYSTEM IS COMPLETELY TESTED, INTEGRATED AND READY FOR PLUG-IN OPERATION WHEN YOU RECEIVE IT. WE TAILOR & CONFIGURE SYSTEMS TO MEET YOUR BUDGET AND NEEDS, WE WELCOME YOUR REQUEST FOR TECHNICAL INFO BY PHONE OR LETTER.

CROMEMCO: Nation-wide maintenance and warranty service now available. SYSTEM I W/O hard disk. . \$2,996. Cromix multi-user systems starting at \$4,713. High resolution color graphics hard disk system Model Z2HGS ...............\$10,875.

NEW SYSTEMS FROM IMS 2 yr warantee on boards! Integrated system with built-in monitor, detached keyboard, 51/4" drives. Systems w/8" drives, optional 10,20 or 40 MB Winchesters, built-in tape back up, multi-user capability (TURBODOS or MP/M). Z-80, S-100 bus. Over 150 configurations to match your specific needs. On site service contracts for NY tri-state area.

SEATTLE 8086 SYSTEMS Featuring 86-DO5, the IBM PC Operating System. System I: 8MHZ CPU set w/1 serial, 1 parallel I/O (additional I/O option) 64KB 16 bit Static RAM, Tarbell DD controller, TEI 22 slot mainframe w/constant voltage trans-.\$2,695. System II: with 128K Static RAM former Interfaced to dual Shugarts 801 \$1,275. or dual QUME DT-8 \$1,680.

CALIFORNIA COMPUTER SYSTEMS 2210A High quality, low price. Z80 CPU, 1 serial port, disk controller w/CP/M 2.2 64K RAM .....\$1,650. Add our Max Box w/dual Shugarts or Qumes and IMS I/O w/2 serial, 1 parallel.

LOMAS DATA 8088/8086 Same CPU & Operating System as IBM PC. Complete LOMAS card set in TEI 12 slot mainframe, 86-DOS, dual Shugarts, Televideo 912,

GODBOUT: Complete product line now available. Discount prices.

MAX BOX DISK DRIVE SUBSYSTEM mfg by John D. Owens Assoc. Dual drive cabinet w/regulated power supply, fan, complete internal cabling. Will hold Shugarts, Qumes, Tandons and/or 8" Winchester, horizontally mounted. Excellent design and engineering.  $17\frac{1}{2} \times 5\frac{1}{2} \times 22$ . Attractive buff color. W/2 Shugart 801 . . . . \$1,275. W/2 QUME DT-8 dble sided drives . . . . \$1,680.

TECMAR 8086 and Z80 Video Digitization systems IBM PC boards and accessories produced by TECMAR also discounted.

GRAPHIC SYSTEM: Advertising • Architects • Designers • Package includes powerful interactive graphics software + MicroAngelo Graphics Subsystem + M9900 16 bit, S-100 w/dual 8" floppies, + HIPAD Digitizer + Plotter .....

PER SCI: Model 299B & 277 with or without cabinet & power supply.

TURBODOS: Spectacular CP/M Compatible Multi-user Operating System. Z80 Code interrupt driven. Up to 6X faster than CP/M; up to 35% increased disk capacity. Available for NorthStar, IMS, TRS-80 Model II, CCS & Tarbell controllers.

> Prices subject to change without notice Write or call for free catalogue

### IOHN D. OWENS Associates, Inc.

12 Schubert Street, Staten Island, New York 10305 212 448-6283 212 448-2913 212 448-6298

the terminal was generating. Just what was going on?

Eventually we found it. The Godbout BIOS for the 8085 expects one pattern of data and stop bits: the Z-19 sends another. To make it worse, the Z-19, although an excellent terminal in many ways-I recommend it as about as good as you can get just now—has some minor bugs in its program chips, and those bugs interact with the Sorcim-supplied 8085 BIOS and Supercalc to generate the strange results I noticed.

If all this seems confusing to you, imagine what I thought about it while it was happening to me! Eventually, though, I got my friend and computer consultant Tony Pietsch together with the Sorcim program specialists, and all was fixed nicely. Moreover, Sorcim is putting the problem and its solution into its Supercalc manual and notifying Godbout. The moral of this story is that if you insist on a state-of-the-art system (such as the Godbout 8085/88), you'd better be prepared for some unexpected results; but if you deal with reputable companies, you'll eventually get satisfaction.

#### Microproof and Spellstar

Then there are the smaller companies: they want to do right, but they have limited resources. A lot of really good software comes out of such companies, but there are some problems too.

Example: As a result of my last column, Cornucopia Software has sent me four separate iterations of fixes for Microproof, Each version had problems, and each time I sent Cornucopia notes on what it probably ought to do. Lo! Cornucopia has now managed to take care of nearly all my objections to the program. It has speeded Microproof up enormously, overhauled the error-trapping procedures, made it easier to use, and generally fixed things up. But Microproof still doesn't handle dashes very well-the program thinks, for example, that "well-the" as I used it here is a candidate misspelled word. Quotation marks give Microproof problems too. There's another difficulty: with Microproof you can correct the word by spelling it properly. after which the program will go through your text file and globally make the changes. What, though, do you do about capitalization? (Mostly you hope you haven't begun any sentences with the word.)

Anyway, it took several iterations. but eventually Cornucopia developed a useful spelling program. A number of other companies have read my

preliminary reviews of other programs and proceeded to patch things up and send me frantic revisions.

"So. You're a quality control department," my mad friend said.

"Well, not for everyone. And sometimes it's a fairly complicated situation like the problems with Supercalc and the Z-19 terminal."

"Yeah, sure," my mad friend said. "But did you ever stop to think how many software houses routinely use

★ ★ ★ GREETINGS TO OUR	FRIENDS IN NORWAY $\star$ $\star$			
HOUSTON INSTRUMENTS PLOTTERS Standard & Intelligent models w/surface areas of 8½"×11" to 11"× 17". Front panel electronic controls. DMP-2\$ 935. DMP-3\$1,195. DMP-4\$1,295. DMP-5\$1,455. DMP-6\$1,685. DMP-7\$1,865.	MICROPRO: Inventory sale on all Micropro software. WORDSTAR			
HAYES MICRO MODEM 100\$359. Smartmodem\$251. Cronograph\$224.	SUBSYSTEM W/LIGHT PEN \$2,300. Includes S-100 graphic card, 15° monitor, detached keyboard, light pen.			
EPSON MX 80 \$475. MX80 F/T \$630. MX 100 \$725. RS232 \$70. 2K BUFFER \$140.	Without light pen \$1,930. Graphics card alone \$975. Screenware Pak II \$350.			
3M SCOTCH® Diskettes In storage box 5 box minimum, price per box. 740, 8" ss/sd	TEKEM: Tektronix emulator\$ 350.  Color systems from 4 to 256 colors. Basic color system (4 colors)\$2,330.			
741, 8" ss/dd\$35.50 743, 8" ds/dd\$45.50 744-0, 5½" soft sectored or 744-10, hard sectored, single sided\$28.50	IDS PRISM COLOR PRINTER\$1,795. Enhanced 560 w/software selectable colors; high speed printing at 200cps.			
Head cleaning kit	CORVUS: New Lower Prices! 6.7MB \$3,005. 11.3MB \$4,655. 20.5MB \$5,595. For S-100 and most other systems.			
RM 12 \$ 655. RM 22 \$ 790. OEM & Qty. discounts offered	KONAN SMC-100 hard disk controller. S-100, 2400MB control \$1,469.			
TARBELL Z80 CPU       \$395.         New I/O card 4S + 2P       \$347.         Double Density Controller       \$435.	Communications SOFTWARE			
PMMI S-100 Modem	Enables communications from a micro to a terminal or to another micro, mini or maxi computer. HAWKEYE GRAFIX Source Code. \$500. Object Code. \$75.			
NEW ITEMS AVAILABLE: Summa Graphics Bit Pads • ALTOS systems • Microline printers • Memory Merchant RAM • PIICEON	MICROSOFT COBOL—80 \$560.  BASIC-80 (interpretor) \$270.  BASIC COMPILER: \$305.  FORTRAN-80 \$380.			
HAZELTINE 1500 \$ 885. 1510 \$ 980. 1520 \$1,210. ESPRIT \$ 695. 1 yr. on-site service contract! \$ 49.	X-MACRO-86: \$275. muLISP/muSIMP: \$190.  FORMULA: ALL-IN-ONE data base + w/p+accounting software \$595.			
TELETYPE  Model 4320 AAK\$1,140.  Model 43ASR, 8 level, 1" tape\$2,595.	QUICKSCREEN\$149. Use CRT as scratch pad, produce quality screens, create reports & forms.			
dBASE II demo package \$75.	Complete software\$595.			
WE EXPORT  Overseas Callers: TWX 710 588 2844 Phone 212 448-6298 or Cable: OWENSASSOC				

their paying customers as their quality control department? Look-how much advance-notice software do you get?"

I thought about it. 'Not too much. Mostly I get advertised stuff because I write and ask for it. Sometimes an outfit will see a review and ask if I want to see its new product. I try to be fair, but I don't have time to help with development."

"But you do anyway. Now think about the poor guy who buys new software that doesn't quite work. He doesn't know what to do. The license agreements discourage sending anything back for refunds. He doesn't even know how to describe the problem, or maybe he hasn't enough experience with competing programs to know he has a lemon. And meanwhile the publishers keep those \$500 price tags-and complain about pirates."

Unfortunately, my mad friend is right. In fact, things are worse than that. Some companies, like Cornucopia, try to fix things when their customers complain and eventually do things right. Others just ignore the complaints and take the money and

And yet. It's certainly to our (the users') advantage that a lot of small software houses spring up. We don't want the field dominated by a few giants with ever-more-restrictive licensing policies ("Levitical documentation," as my mad friend calls it). We want a lot of competition, which means, I guess, that those of us who like to try new products just better get used to being unpaid quality control departments. Sigh.

I have another spelling program, Spellstar, It's pretty nifty. It's a bit slow, compared to Spellguard, but it does have some nice features. For example, Spellstar lets you mark the words you're interested in, then shows you the document with those words highlighted; on my Z-19, they're in reverse video. So, there they are, completely in context and marked so I can't miss them. Very

Even better, if you tell Spellstar to ignore a word in the future, it'll do that: from then on, when it hits the marked word, it will unmark it and go right past it. When you drop out of Spellstar vou're in Wordstar, so that you can use a global search and replacement to fix every future instance of the mistake.

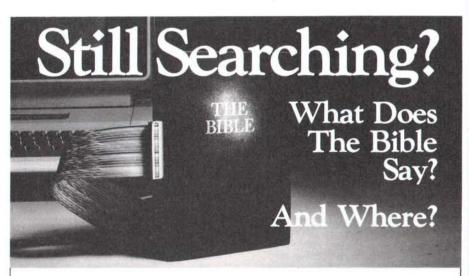
Indeed, if I used Wordstar as an editor, I'd be tempted to use Spellstar in connection with it. However, I do have to warn you that a couple of my knowledgeable friends who do use Wordstar and who have Spellstar available to them prefer to use Spellguard on the grounds that it is just overall more convenient, especially for longer documents.

#### Languages, Mon Amour

I know of two new BASIC compilers, and they're both excellent, It's almost an embarras de richesse. In my last review, I described the new features of Microsoft's BASCOM BASIC Compiler, I mentioned that Microsoft has added CHAIN and COMMON and that now only one run-time package is necessary.

One major consequence of only requiring one copy of the run-time program to be present on the disk (even though you may have half a dozen compiled programs) is that the compiled programs are shorter. Not all that much shorter, if you count program and run-time package; but the instant you have several compiled programs present, the disk savings mount. (I chuckle at that now: with my new Oume double-sided doubledensity disk system, I have more than 2 megabytes of floppy storage available, which means I don't worry so much about disk space. Yet. . . .)

Of course, if you use the run-time package, you're liable for the new royalty payments on any software you sell. (Microsoft dropped the royalty requirement for programs compiled with the old BASCOM, as I discussed in my last column.) You could, I guess, sell programs written



Now you can use computer technology to search the Bible on any subject. With THE WORD processor (including a disk copy of the complete KJV Bible text) you can create indexes on keywords. Or phrases. Even on concepts.

A full spectrum of text search functions allows detailed analysis for the real student of the Bible.

Print or display selected verses and/or references for personal study or Bible classes. Build your own computerized library of research material.

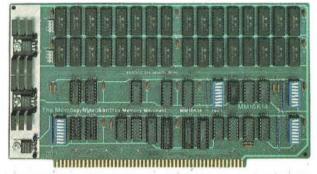
Bible Research Systems • 8804 Wildridge Drive • Austin, Texas 78759 • (512) 346-2181 or call Your Local Dealer

Requires 48K, 1 disk drive, APPLE or TRS-80 APPLE is a trademark of APPLE Computer, Inc.

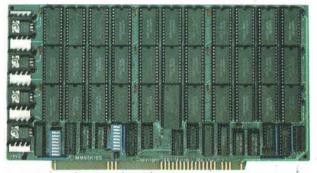
\* Plus \$2.50 postage/handling TRS-80 is a trademark of Tandy Corp.

### 5-100 STATIC MEMORY BREAKTI





### **16K STATIC RAM \$169**



32K PARTIALLY POPULATED \$479 48K PARTIALLY POPULATED \$659

Finally, you can buy state-of-the-art S-100 static memory for your computer at unprecedented savings.

Memory Merchant's memory boards provide the advanced features, quality and reliability you need for the kind of operational performance demanded by new high-speed processors.

#### COMPLETELY ASSEMBLED

These memory boards are not kits, nor skeletons-but top quality, high performance memories that are shipped to you completely assembled. burned-in, socketed, tested and insured with one of the industry's best warranties.

#### SUPERIOR DESIGN & QUALITY

Memory Merchant's boards are created by a designer, well-known for his proven ability in advanced, cost-efficient memory design. Innovative circuitry provides you with highly desired features and incredible versatility.

Only first quality components are used throughout, and each board is rigorously tested to assure perfect and dependable performance.

#### SHIPPED DIRECT FROM STOCK

All Memory Merchant's boards are shipped direct from stock, normally within 48 hours of receipt of your order.

#### **NO RISK TRIAL**

We are so convinced that you will be absolutely delighted with our boards that we extend a no risk trial offer. After purchasing one of our boards, you may return it (intact) for any reason within 15 days after shipment and we will refund the purchase price.

#### **NEW 18 MONTH LIMITED** WARRANTY!

The reliability of our boards, through quality controlled production and proven performance, has enabled us to extend our warranty to a full 18 months. This includes a 6 month exchange program for defective units.

#### **HOW TO ORDER**

Please send check, money order, VISA or MASTERCHARGE (add ICA#) with your order. Sorry, no C.O.D.'s. Specify model number, and quantity desired. Shipping and handling charge is \$5.00 per board. California residents add 6% Sales Tax. Credit card purchases may be telephoned to (415) 483-1008.

**OEM** and **DEALER** inquiries invited.



14666 Doolittle Drive San Leandro, CA 94577 (415) 483-1008

#### 64K RAM. Model MM65K16S

Cool running operation to 10 MHz Ultra low-power consumption Fully loaded 64K board draws: Typ. 350 Ma. (Max. current 550 Ma.) Bank Select Capability **Extended Addressing Capability** One 16K submodule equipped with a 2K window which may be located in any of the 2K segments

2716 (5V) EPROM Compatibility: Programmed 2716 EPROM's may replace any or all of the RAM

Four independently addressable 16K submodules on one board organized as two pair of independent 32K banks or as one 64K Extended Address Page. Each 32K bank responds independently to phantom. Bank Select logic is compatible with either Cromemco Cromix\* or standard Bank Select software. \*Cromix is a trademark of Cromemco.

New 16K (2K X 8) 150ns Static RAM Runs on any S-100, 8-bit system MPM Conversion Option: Write for details.

#### 16K RAM. Model MM16K14

Bank Select Capability **Extended Addressing Capability** One 4K segment equipped with 1K windows

Four independent 4K X 8 byte segments

Uses field proven 2114 (1K X 4) Low-power consumption (Typ. 1.3 Amps) Runs on any S-100 8080, 4 MHz Z-80 or 5 MHz 8085 system.

Prices, terms, specifications subject to change without notice.

in Microsoft BASIC and compilable with BASCOM, leaving it to the customer to buy his own copy of BASCOM with a run-time package.

And, of course, you can use BASCOM to develop as many programs as you like for yourself. Since BASCOM is almost the same language as Microsoft's BASIC-80 interpreter, the result is a very powerful tool: you can run programs interpretively, squeezing out the syntax errors, then test the program logic, all while having an instant editor available for fix-up. Now, true, it would be a lot easier if BASIC-80 didn't simply dump your program and scrub all its variables whenever you make any program change whatever (even to add a remark!); but you can't have everything. (I wish we could, though; and if Microsoft wants to update BASIC-80, I strongly suggest that improvement.)

A second major defect of BASCOM is its surprising inability to deal with arrays. The rule with BASCOM is, once dimensioned. always dimensioned. You cannot change dimensions at all. Worse, you can't compute the size of a dimension, even if the compiler has been told everything it would need for the calculation. You can't even use a variable for dimension size. The result is that if you make up a database program—as I have; see last month's column for details-you must either recompile any time you change the database structure, or you must waste a lot of memory on larger than necessary arrays; neither choice is convenient.

Finally, BASIC-80 and BASCOM have a strange random-access file structure-and you cannot access the random files as if they were sequential. Microsoft's BASIC stores random files in a packed binary-code format that very efficiently uses the disk space: but the files aren't ASCII (American Standard Code for Infor-

mation Interchange) standard and can't be printed by any program not written in Microsoft BASIC, and that can be a pain.

So: given the defects, what are the alternatives?

#### Digital Research's CB80

One solution might be to turn to Pascal and be done with it. Why mess with BASIC at all? Compiled Pascal MT+, or INT-file Pascal such as is created with Sorcim's Pascal M or UCSD Pascal, is supposed to be faster, easier to write, more efficient, and inherently better structured than the best BASIC ever written. (I'm not convinced; the few tests I've tried show BASIC programs compiled with BASCOM are about as fast as MT+ and faster than UCSD Pascal.)

Besides, now comes Digital Research's new CB80 to challenge the whole notion.

CB80 was written by Compiler Systems, which in essence means

### THE BUSINESS POWER OF 60 MINI DISKS!

### MEGABYTER WINCHESTER DISK SYSTEM **AMS 5000**

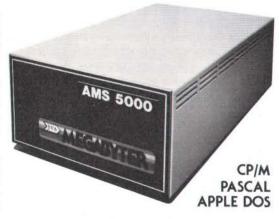
Around the world and across the nation, business people and serious Apple II users are stepping up to SVA MEGABYTER SYSTEMS — Big storage at a low price.

Now the SVA AMS 5000 provides 5 to 10 megabytes of flexible and convenient on line data storage. This complete self contained 5" winchester disk drive memory system is attractively packaged and ready to run.

Imagine the power of accessing more than 60 mini disks simultaneously. And it's so easy to use you won't even know it's there. Most applications using the CP/M, DOS, PASCAL operating system will run on MEGABYTER systems.

Enhance those large and complex applications with near instant program and data access — that means fast and convenient operation of accounts receivables or payables, inventories, medical data, insurance billings, etc. Increase Data Base performance with the superior large file accessing capability of the AMS 5000. Call SVA today for expert application assistance.

\*CP/M Trademark Digital Research, APPLE DOS Trademark of Apple Computer.



Rely on SVA for BACKUP data protection, archival data storage, and data transportability with the AMS 8000 MEGABYTER 8" floppy disk system. This system features high capacity removable media, IBM 3740 compatible, and may be used to transport data to other computers.

Preventative maintenance is not required for the AMS 5000. It's designed to operate continuously and is backed up by SVA's 6 month warranty with optional long term maintenance.

The best news of all is low price - A complete 5 Megabyte AMS 5000 MEGABYTER memory system is only — \$3,339.

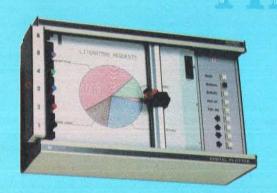
To order your AMS 5000, call SVA today or contact your Apple dealer. Look to SVA for a growing line of Apple Memory System products . . . . SVA means business!!

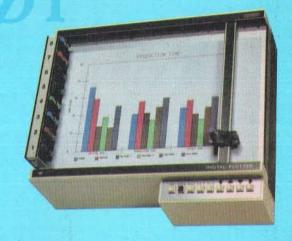


#### SORRENTO VALLEY ASSOCIATES

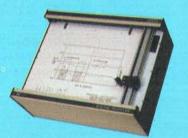
11722 Sorrento Valley Road San Diego, CA 92121-1084 (714) 452-0101 TWX 910-335-2047

### Look what's happened to

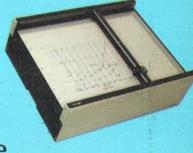












It's grown into a complete family of quality low cost digital plotters with one, six and eight pen models available

Yes, they are UL listed! \*\*

In just a few short years, the HIPLQT has become the most popular digital plotter among small systems users. With a record like that, what can we do for an encore? WE'VE INTRODUCED A COMPLETE LINE OF HIPLQTS... with a model suited for just about every plotting application.

The HIPLØT DMP Series is a new family of digital plotters with both "standard" and "intelligent" models available with surface areas of  $8\frac{1}{2}$ "×11" (DIN A4) and 11"×17" (DIN A3). For the user needing a basic reliable plotter, we have the "old standard" DMP-2 ( $8\frac{1}{2}$ "×11") and the "new standard" DMP-5 (11"×17"). For those needing a little more capability, there are the DMP-3 ( $8\frac{1}{2}$ "×11") and the DMP-6 (11"×17")—both microprocessor controlled and providing easy remote

positioning of the X and Y axes (perfect for the OEM). For those who want this in-

telligence plus the convenience of front panel electronic controls, we've provided the DMP-4  $(8\frac{1}{2}"\times11")$  and the DMP-7  $(11"\times17")$ .

The "standard" plotters come complete with a RS-232-C and a parallel interface. The "intelligent" DMP plotters accept data from either an RS-232-C or Centronics® data source. For the "standard" plotters, software is available from our ever expanding "Micrographic Users Group". The "intelligent" HIPLØTs use our exclusive DM/PL<sup>TM</sup> language which minimizes plot software to a fraction of that normally associated with digital plotting.

And that's only part of the story. Now you can enjoy the advantages of multi-pen plotting capabilities with all six HIPLØT models. The DMP-2, 3, and 4 are available in a 6-pen format

— there's an 8-pen option for the DMP-5, 6, and 7. So you can now have multi- color graphics under program control at an affordable HIPLQT price.

With the new DMP Series, high quality digital plotting can now be a part of your system. It just doesn't make sense to be without this valuable tool when there is a DMP plotter with the plot size, speed and capabilities that are exactly tailored to your specific needs ... and your budget.

Prices for the DMP Series start at only \$1085. Multi-pen plotters start at a low \$1480

\$1480.

For complete information, contact Houston Instrument, P.O. Box 15720, Austin, Texas 78761. (512) 835-0900. For rush literature requests, outside Texas, call toll free, 1-800-531-5205. For technical information ask for operator #5. In Europe,

contact Houston Instrument, Rochesterlaan, 6 8240 Gistel, Belgium, Phone 059/277445.

Circle 39 for literature.

Circle 40 to have representative call.

\*\* DMP 2, 3 and 4 UL listed DMP 5, 6 and 7 UL listing pending

INSTRUMENTS & SYSTEMS DIVISION Together...we'll create tomorrow.

TM HIPLOT and DM/PL are Trademarks of Houston Instrument

Registered Trademark of Centronics

BAUSCH & LOMB

### IN STOCK TOLL FREE LOW PRICES FAST DELIVERY

#### THIS MONTH'S TOP TEN

TITLE	MANUFACTURER	LIST	NOW
WordStar	MicroPro	495.00	299.00
WordStar w/MailMerge	MicroPro	645.00	385.00
dBase II	Ashton-Tate	700.00	499.00
Supercalc	Sorcim	295.00	210.00
Pascal MT+	D. Research	475.00	425.00
CalcStar	MicroPro	295.00	185.00
CB80	D. Research	500.00	420.00
FMS 80 I	Systems +	495.00	359.00
Pascal M	Sorcim	395.00	295.00
Select w/Superspell	Select Info Systems	595.00	395.00

#### MOVING UP THE CHARTS.....

Spellguard	ISA	295.00	225.00
Supervyz	Epic	100.00	90.00
Spellbinder	Lexisoft	495.00	295.00
Condor II	Condor	595.00	450.00

#### **GREAT HARDWARE BUYS!**

Features: 125 CPS Placetty of a to feed, parallel or serial interface to the property of the p



EPSON MX-80 with GRAFTRAX! List \$745..... \$499.00

HAYES SMARTMODEM- List 279.00 ......\$230.00

SIGNALMAN MARK I direct-connect modem \$99.95 Auto Answer, W/RS-232 cable

Call for similar savings on ZENITH, ALTOS, OKIDATA, HAYES, NORTHSTAR, TELEVIDEO, NEC, XEROX, ANADEX, QUME, XCOMP, IDS, CENTRONICS, AMDEK, NOVATION, SANYO, EPSON.

#### MORE SOFTWARE HITS.....

ART, INTELLIGE	NCE	FRIENDS SF	W.	MICRO-AP		MICROSOFT		STD. MICRO	SYS.
Dental 750	0.00	Access 80	240.00	Selector III	165.00	COBOL 80	575.00	Quic-n-Easi	299.00
Medical 750	0.00	Access 80 II	405.00	Selector IV	235.00	Macro 80	175.00	Mailman	105.00
BUS. PLAN. SYS	5.	GRAHAM DO	RIAN	Selector V	395.00	Edit 80	110.00	STRUCT. SY	
Plan 80 240	0.00	Apt. Mgmt.,		Glector III	170.00	MuMath	220.00	G.L., A. Rec	
DIGITAL RESEAR	CH	C. Reg., Inv.	1.	Glector IV	250.00	MuLisp	170.00	A. Pay, Payr	oll
PL/1-80 420		Pay I each		SBasic	255.00	MSort	135.00	Inv, OE, ea	850.00
CBasic 125	5.00	GLedg, Inv. I	1.	MICROPRO		SYSTEMS P	LUS	Analyst	225.00
CP/M 2.2 135	00.6	OE/Inv., Pay	II.	Cust Notes	350.00	Acct. Plus		Ltright	175.00
MAC 85	.00	Job C., each	710.00	DataStar	225.00	1 Module	425.00	SUPERSOFT	
ECOSOFT		KEY BITS		SuperSort I	170.00	2 Modules	785.00	Disk Doctor	95.00
Microstat 250	0.00	Wordsearch	175.00	SpellStar	165.00	3 & Up	CALL	Forth	175.00
FIN. PLAN. ASSI	DC.	MARK OF UN	ICORN	MICROSOFT		MIDW. MIC	RO TEK	SSS Fortran	210.00
Mini-Model 375	00	Mince	148.00	Basic 80	275.00	Cross Assen	n.	Tiny Pascal	80.00
FOX & GELLER	1	Scribble	148.00	Compiler	310.00	68XX	250.00	C Compiler	174.00
Quickscreen 140	0.00	Both	245.00	Fortran 80	395.00	Others	CALL	StarEdit	189.00

This is just a sample of the CP/M software available from DATASOURCE. Call us for great savings on the package you're looking for APPLE TOO! We carry many of these items in Apple CP/M format..call!

24 HOUR ORDER LINE: 1-800-328-3890 EXT. 6014 (ORDERS ONLY)

IN MINNESOTA: 1-800-682-3816 EXT. 6014 (ORDERS ONLY)

TECHNICAL HOTLINE: 1-612-944-7907 (PRICING, DELIVERY, OR TECHNICAL INFO)

#### ORDERING INFORMATION

MAIL ORDERS: Cashier's check or money order. Charge cards add 3%. Ship-ping: \$3.00 per soft-VISA ware item, 2% per hardware item. Mn res. add 5% sales tax. Pricing and avail. subj. to change. Prices are mail order only. DataSource is a Division of DataSource Systems Corporation

#### DataSource Systems

P.O. BOX 35007 MINNEAPOLIS,MN 55435 612-944-7907

#### User's Column -

Gordon Eubanks, the author of CBASIC: and in a real sense CB80 is compiled CBASIC. You can compile all of your CBASIC programs with only minimal changes. Thus CB80 has all the advantages and disadvantages of CBASIC-2.

Advantages abound, CBASIC programs are nice to work with. Just for starters, you can redimension arrays as often as you like. You can access random files sequentially, and the file structure is standard ASCII for all files. There's a UCASE (uppercase) function and a nice search function that looks to see if what you want is embedded in anything else.

Another advantage of CBASIC over Microsoft's BASIC-80 is string space allocation; although CBASIC is a little slower in processing each input line (and slows down more and more as memory fills up), it does its "garbage collection" on the fly, so to speak, BASIC-80, on the other hand, runs at higher speeds until it runs out of string space-after which you find yourself completely locked away from your computer, unable to do any input or output or anything else for something like one to four minutes while BASIC-80 goes chasing through memory finding old strings the program has been told to forget. Eventually BASIC-80 clears everything up and becomes responsive again, if by then you haven't got so furious you've hit the Reset button.

So. CB80 is very nice. But, there's no interpreter. As with Pascal, FOR-TRAN, PL/I, or any of the compiled languages, creating large programs in CB80 takes a lot of time. First you have to create the program on an editor; then you compile it, finding a number of trivial syntax errors that you must fix by loading in your text editor and mashing the source program: then you compile again, then link, and then run with the run-time package. By the time you're done, you can use up an afternoon to develop a pretty simple program.

However, because CB80 is compiled and has no line numbers to fool with, you can put in tons of remarks,

#1 Express Service:

# Hertz announces the end of the line.

If you're tired of standing in airport car rental counter lines, Hertz has a way to beat them. It's called #1

Express™ Service.

To see how easy it is, pick up a #1 Express pass the next time you're at one of our counters. Or ask your travel agent department.



#1 For Everyone.TM

\*Available at 35

PN-1



For a supply of #1 Express

Name

Address

passes, send this coupon to: #1 Express Pass Hertz Corp. 660 Madison Avenue,

New York, N.Y. 10021

City, State and Zip



Hertz 1 Express

Circle 168 on inquiry card

### DISCOUNT LINE

1-800-528-8960

#### GUARANTEED **LOW PRICES**

16K RAM - \$120 Z80 CARD - \$279 Videx Card - \$249 CPS CARD - \$179 Graphic Card - \$89 Clock CARD - \$229

ALTOS

8000-2 - \$2675 8000-15 - \$3975

ANADEX

9500 - \$1200 9501 - \$1200

ATARI

400-16K - \$349 800-16K - \$669 410 - \$59 810 - \$429825 - \$569 850 - \$149

C-ITOM

25CPS-P - \$1299 45CPS-P - \$1459

DATASOUTH

DS120 - \$595 -\$1259**DS180** 

DIABLO

630 - \$1945

1640 - \$2475

DISKETTES/BOXES Plain - \$20 Scotch - \$25 Dysan - \$35

**EPSON WITH GRAPHICS** 

MX70 - \$289 MX80 - \$429 MX80FT - \$519 MX100 -- \$689 GRAPHIC ROM - \$79

HAZELTINE

1500 - \$995**ESPRIT** — \$595

LOBO

Apple Drive/Card - \$390/\$90

MODEMS

HAYS - MICROMODEM -Novation - Cat - \$149

Penril - 300/1200 (212A) - \$795

MONITORS

Teco-BW - \$99 Teco-Green - \$115 Sanyo-Green — \$249 Color - \$425 Amdek-Green - \$159 Color - \$349

NORTHSTAR

Advantage - \$2995 HR64QD - \$3025

NEC

8023 - \$489 7710 - \$2350

88G - \$569 99G - \$659

SOROC

120 - \$659 135 - \$689

TELEVIDEO

912 - \$669 950 - \$915TI

810 - \$1240 820 - \$1795

SOFTWARE

All Major Brands - \$CALL **MOUNTAIN HARDWARE** 

Romplus - \$119 Music System - \$429.00

OKIDATA

M80 - \$325 M82A - \$459 SL125 - \$3150 SL250 - \$4200

M84 - \$1179 M83A - \$729

XEROX 820 - \$2399

ZENITH

Z19 - \$669 Z89 - \$2129

Arizona 1-602-246-1783

## CORPORATION

2231R W. Shangri La Rd. Phoenix, AZ 85029

#### User's Column-

meaning that if you come back to your program in six months you have half a chance of understanding it.

And actually CB80 is better than that.

Now it has labels. Instead of "GOSUB 3680" you can say "GOSUB COUNTIT". or "GOSUB PROCESS.ONE.ITEM". Better yet, you can have very complex functions, which you call and pass parameters to; and the functions use purely local variables that can't affect anything in the program outside.

The functions can take up many lines, and they can be "external," meaning that the function can be in an entirely different program "module" that gets called in at link time. Multiple-line functions can also access and change external variables; and the whole mess can be called by value, as in the statement "WHILE FARNUM(FOO)" where "FARNUM" has previously been defined as a function of the variable "FOO."

More vet, a multiline function can have both purely local variables and variables created just for that function (the variable "X" in the function is not the same as the variable "X" in another function or in the main program) and can also affect regular global variables in the rest of your BASIC program. This means you could have a function called "YES" that prints a prompt, gets an input, checks to see if the first letter of that input is either "v" or "Y," and informs the main program.

In other words, CB80 has got pretty darned close to Pascal's functions and procedures, and it seems to be a lot faster than Pascal too. You could sit down and write a really neat set of "software tools." You can, with CB80, build a whole library of useful program modules, setting them up in nice orderly blocks to be called in when needed.

That, of course, is the answer to the "no interpreter" problem: build a set of functions that you know will work and include them in the new programs you write. After a while you'll find that most programming consists of stringing together routines

known to be reliable and once in a while developing a new function to stick into your tool kit.

Although CB80 is marketed by Digital Research and the manual flies Digital's colors, don't despair: the documentation wasn't really written by Digital, meaning that it's not encrypted and translated into Swahili, as much of Digital's documentation is. It does have some of the fine hand of the Digital hacker about it; for example, the text is peppered with incomprehensible "syntax diagrams," as if they were supposed to mean something; and here and there the sentence density gets completely out of hand. For the most part, though, the CB80 manual is in the really excellent style of the old CBASIC manual: clear, concise, and with plenty of examples. You need not be afraid of it.

You might, however, be afraid of CB80's price, which is steep, and its licensing policy, which is sheer madness: that is, Digital Research wants a flat \$2000 a year if you're going to compile, link, and market programs using CB80. (The fee applies only to programs you distribute, not to those developed for your own use; still, it's onerous enough.) Again, I suspect competition will bring this down; meanwhile, we can wait. . . .

#### Which Language Now?

So. We have increasingly better BASICs, and one of these days we'll get a compiled language as good as CB80 with an interpreter as good as Microsoft's BASIC-80. When that happens, I think FORTRAN and COBOL and even Pascal are going to suffer a sharp drop in popularity.

My mad friend, meanwhile, continues to praise PL/I, which he says is easy to learn and remarkably effective. I confess I haven't had time to write anything but the simplest programs in PL/I or indeed even had time to examine it; but my mad friend is usually fairly reliable in his judgments and has a very healthy attitude toward computers, namely that they're for him to use and are not masters that control him.

# TIM

### The Non-Programming Approach to Data Base Management

#### Data Base Management

Data management packages were created to save time and money in the development of software solutions to information problems. Many have been designed to accomplish just that, although most have only the programmer in mind. Sure they would save time in the long run, but what of the initial investment in time and effort required to learn the new language? What about the non-programmers in the world who would like an easy yet powerful applications generator? The solution is one of the most highly acclaimed software packages of our time, T.I.M. III.

#### What is T.I.M.?

T.I.M. is **Total Information Management**. Programmers love it due to its original solutions to classic data management problems. Non-programmers adore it since they can use it to achieve the same results as with other more complicated programming-like packages.

### What Makes T.I.M. So Simple to Use?

We at Innovative Software, Inc. designed T.I.M. from day one with the end user in mind. Maybe he is a programmer who doesn't have time to learn a new language. Or perhaps a neophyte who fears coding pads and lines numbered by tens. We felt that a data management package should be able to be used by anyone from a systems analyst to a secretary. That's why T.I.M. takes a full menu-driven approach, uses multiple HELP screens, and has a manual that sets a new standard in documentation.

#### The Manual

Many people believe that the manual is just as important as the software itself, a view that we at Innovative Software, Inc. tend to share. The manual for T.I.M. is divided into two sections, the Reference section and the Primer. The Reference section describes all of T.I.M.'s commands and subcommands. This is done in English, not in technical terms or in our own language. Even if you have

never seen a computer before in your life, you'll be able to read and understand our manual immediately. The second section is a primer which goes through several examples for you, again in plain English. These true-to-life examples take the beginner by the hand, and instructs him what to do and when. You will be able to see for yourself that T.I.M.'s only limitation is the imagination of the user.

#### Features of T.I.M.

T.I.M. has all of the features one has come to expect from a data management package, as well as many new ones. For example, a *word processing* interface that allows you to merge information from a T.I.M. file with letters or other documents created by a word processor. Now you can automatically send personalized letters to hundreds or thousands—quickly and easily. T.I.M.'s *Select* command enables you to pull specific information from a file. For example. "All customers who live in a certain ZIP code, whose last name begins with the letter A to L, whose balance due is less than \$50.00." A sophisticated *report generator* and even a *list generator* are also included.

How powerful is T.I.M.? With a maximum record size of 2400 charactars and the ability to keep up to forty fields sorted properly at all times, T.I.M. is powerful enough to handle just about any application. T.I.M. can handle over 32,000 records per file, and two files can be linked together for reports if your application requires a many-to-one relationship. T.I.M. also includes all of the same editing commands as your word processor, thus making data entry and editing a snap. You can also pull selected records from one file to place them into another. Files may be restructured to add or subtract fields and/or change field lengths or types. T.I.M. even has it's own utility for backing up hard disks onto floppies.

#### Where to Find T.I.M.

T.I.M. is available from many fine computer dealers across the country. Or you may purchase from us direct by calling 913/383-1089.

Either way you will have the finest data management program available.

Available for CP/M,\* and IBM PC DOS.\*\*
CP/M version—'695. IBM PC version—'495.

Innovative Software, Inc. 9300 W. 110th Street, Suite 380 Overland Park, Kansas 66210 USA 913/383-1089

TIM is a Trademark of Innovative Software, Inc.
\*CP/M and MP/M are Trademarks of Digital Research
\*\*Trademarks of IBM

#### Accounts Comprehensible

Once again I find myself embarrassed: I have to review a program I've written.

I have most of the many computer accounting packages available. Some, I guess, are really swell for what they do; but not one of them. not one, looks too useful for me.

I'm a writer. A good part of my life is deductible. It's amazing just how many activities turn out to be income-related research. And it comes as no surprise that the Internal Revenue Service is very interested in the records demonstrating that.

And therein lies the problem. Sure, I could hire an accountant. Many of my colleagues do, and a lot of them think I'm crazy when I tell them I keep my own books and make out my own tax returns. And yet, when I begin to question those colleagues, I find that I don't work any harder than they do. By the time they've explained everything to an accountant, turned in all the receipts, and kept all the records and diaries that the accountant wants, they've usually done more work than I do; and they pay more taxes too.

I've always kept my own books: one of the main reasons I let my mad friend talk me into buying Ezekial. my Z80, was the hope that I could computerize my accounting system. Thus I have for years pounced on every new accounting program eagerly and I've been disappointed every time.

Most "accounting" programs don't produce what I would call accounting books. Instead, they offer "special reports." Now understand: I don't know a darned thing about accounting. Everything I think I know came from two books, Donald H. MacKenzie's Fundamentals of Accounting and John N. Myer's Accounting for Non-Accountants. Those books explain what accounting is all about; and with pictures and illustrations, they give actual examples of journals and ledgers with the funny single, double, and triple lines, the complex scheme of indentations, and the strange check marks favored by accountants. And as far as I'm concerned, that's what my company's books ought to look like.

Nor am I completely mad; every couple of years I have my boys drift into the local university bookstore and buy all the accounting textbooks they can find, and I look through them; and lo!, the textbooks still show that accountants like double and triple lines, and complicated indentations, and. . . .

Yet, there's no computer accounting program that I know of that produces books that look like the books in the accounting texts; and because that's the only thing I could understand with my cookbook knowledge of accounting, I had no real choice. I had to write programs that do make journals and ledgers that correspond with the examples in the elementary accounting textbooks.

Which is what I did. My account-



InterSystems has done it again! The new Series III operates at 6 MHz and includes software to fully utilize the 256K high speed memory. You can buy it from BRIDGE for \$5545—check out these features. . .

- Operating system software that effectively utilizes the 256K RAM
- CP/M 2.2 and Cache BIOS<sup>™</sup> that speeds operation up to 4 times
- 6 MHz CPU with powerful 1 MByte memory management system
- 256K memory—6 MHz with parity and 8/16 bit transfers
- S-100 Bus follows IEEE 696 Standards
- Two serial ports and four parallel ports with two interrupt controllers
- Dual double-density soft-sectored 5<sup>1</sup>/<sub>4</sub>" drives (0.8 MByte total)
- · Easily upgraded to 6-user MP/M system.

But we are sure that you want turnkey operation, so we have packaged a system that includes . . .

- InterSystems Series III Computer P/N CB-256/525
- BMATE<sup>™</sup> screen oriented text editor/word processor
- Zenith Z-19 or Televideo 950 Terminal.

#### INTRODUCTORY OFFER

#### ORDERING INFORMATION

Special List Offer InterSystem CB-256/525 Computer with software \$6545. \$5545. As above with BMATE ™ and Zenith Z-19 Terminal 7590. 6495. As above with BMATE ™ and Televideo 950 Terminal 7935. 6725

For something still more powerful, ask about the BRIDGE enhanced systems, including the FORTRAN Development and the Compiler systems, based on InterSystems computers.

Call to order, or send for complete information. Dealer inquiries invited.

Donter Systems

#### Authorized Distributor

Cache BIOS is a trademark of Ithaca InterSystems. Inc. BMATE is a trademark of BRIDGE Computer Company, Division of Sea Data Corporation.



ONE BRIDGE STREET NEWTON, MASS. 02158 U.S.A. PHONE: (617) 244-3203

The MICROMINT Z8 BASIC COMPUTER/CONTROLLER board represents a milestone in microcomputer priceperformance. It is cheap enough to be programmed directly in a high level language, and efficient enough to be battery operated if required. The entire computer is 4" by 41/2" and includes a tiny BASIC interpreter, 4K bytes of program memory, one RS-232 serial port and two parallel ports, plus a variety of other features. Using a powerful Z8 microcomputer chip and Z6132 4K X 8 RAM, the Z8 BASIC COMPUTER/CONTROLLER board is completely self-contained and optimized for use as a dedicated controller. The unit is assembled and tested and comes with over 200 pages of documentation.

The price, in single quantity, a tiny \$195.\*

Optional power supply
(+5,+12 and -12V) \$35.

Please include \$4 for shipping and handling.

\*Call Micromint for quantity pricing

**Z8 MICROCOMPUTER** 

- · On board tiny BASIC interpreter.
- · Parallel and serial I/O ports.
- •6 interrupts.

**RS-232 CONNECTOR** 

 Just attach a CRT terminal and immediately write control programs in BASIC.

4K BYTES OF RAM

• Z6132 4K X 8 low power quasi-static RAM. EPROM pin compatible. SWITCH SELECTABLE BAUD RATES

•110-9600 BPS.

**FULLY EXPANDABLE** 

 Data and address buses available for 124K memory and I/O expansion.

· 2 onboard parallel ports.

• 7.3728MHZ crystal for fast control operations.

JUMPER SELECTABLE MEMORY OPTIONS

4K RAM, 2716 or 2732 EPROM operation.
 LOW POWER

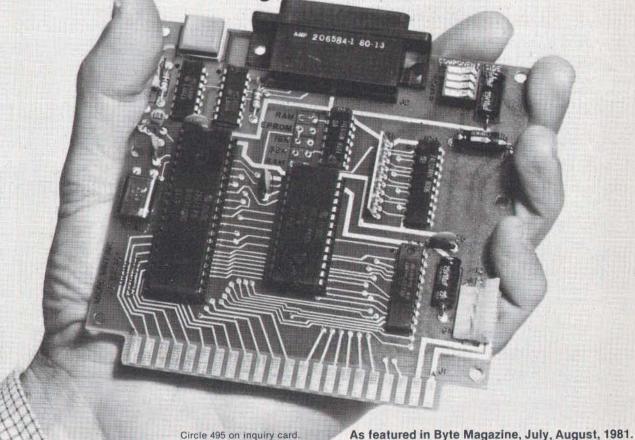
 Consumes only 1½ WATTS at +5, +12 and -12V (optional power supply available). To Order: Call Toll Free 1-800-645-3479

For Information Call 1-516-374-6793

MICROMINT INC. 917 Midway Woodmere, N.Y. 11598

Willer William Control of the Contro

Micromint will put both a computer development system and an OEM dedicated controller in the palm of your hand for only \$195.



ing system starts with a simple-minded thing that lets you build a chart of accounts, essentially a list of ledger page names each with a corresponding ledger page number: for example, 501, postage; 506, office supplies; 506.012, travel supplies; 523, business charitable contributions; 923, family charitable contributions.

You can add to the chart of ac-

counts at any time, and you can use fractional page numbers, from .001 to .999, if you like, because each ledger page will become a CP/M file title "LED-xxx.yyy," as for example LED-506.012.

After you make a chart, you use the Journal program to build journals. A journal entry consists of a line that indicates to whom you paid (or from whom you received) something, a longer explanation line, an amount, and a series of debits and credits that the program keeps track of (I hate to remember that when you spend money you *credit* cash and *debit* the account you spent it on). The program will not allow you to enter an item that doesn't have equal debits and credits.

You can put stuff into the journal in any order you want; there is then a program that will allocate the journal entries by date, so that the journal becomes a chronological record of what you spent and for what. The program has ways of entering cash, checks (from more than one account if you like; I have two interestbearing checking accounts and one commercial account, and I need to keep them all straight), a dozen different credit cards, and so forth. It also keeps track of check numbers.

Once you've built a journal, you can print it; that requires a printer that can print solid vertical bars (ASCII character 124 in decimal) in order to reproduce the single, double, and treble lines so loved by accountants.

You can then use the Post program, which takes the journal entries and allocates them among the various ledger pages you created in the chart of accounts. Journal has provision for control accounts. I suppose I better explain that. Let's say a primary expense category is postage, and that's the way I intend to report the expenses to the IRS. However, I often find I have to send express mail packets. These ought to be charged to a particular project-in my case, of course, a project is a book. Thus I debit the book account and credit the controlled account; I also debit postage and credit cash. When I get income from that particular project, the book gets credited, as does "agented income," while the bank account's and the controlled account's summary pages get debits; once again the books balance, and I can get some clues about the profitability of any particular book.

Anyway, Post takes care of all that, after which another program

### **COMPUTER FORMS**

**AND SUPPLIES** 





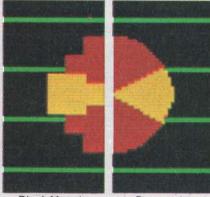
## Norpak Color Raster Display Generator

the only thing better than our picture is our price

#### Satisfy your demand for text and sophisticated graphics

#### **Features**

- compact single board display controller
   high efficiency 6809 microprocessor
   Telidon alphanumeric/geometric Videotex software in ROM
- RS232C full duplex communication independent transmit/receive baud rates, strap selectable from 75 to 9600 baud (odd, even or no parity). 200 x 256 x 4 bit high speed raster video RAM 8 grey levels (black to white), 6 colors and blinking white RS170 RGB video and composite sync outputs. input device interface for optional keypad or keyboard. 8 character sizes including a maximum of 20 lines of 40 characters each.



Block Mosaic

Geometric

#### **Ease of Operation**

By virtue of the Picture Description Instruction (PDI) protocol used in Telidon Systems, images may be created from familiar graphic primitives such as points, lines, arcs and polygons. This same presentation level protocol is recognized as an international videotex standard and forms the kernel of the protocol selected by AT & T for their image communication networks. The use of an 8 bit data format, ASCII standard characters and RS232C serial communication, enhances the general purpose nature of the NORPAK display generator.

#### **Applications**

The compact size and low power consumption of the basic module facilitates integration into a complete display unit which may include a monitor and other specialized communications interfaces. It may be used as a simple output device connected to a computer or may form part of a stand-alone workstation. Many users who have been introduced to the potential of color graphics, through low resolution mosaic displays, will enjoy the increased spatial resolution of the pixel oriented raster bit plane technology. Some of the many potential applications include:

- display generator for VIDEOTEX applications
- output device for system status in a process control environment
- business graphics generation
- student display for educational applications
- graphic artists sketchpad
- · video games

This color display generator is available from stock for \$499.00 (U.S.) FOB Kanata, Ont., Canada. (Shipping and duty extra). For more information contact our sales office. (OEM discounts available).

norpak

NORPAK LIMITED 10 Hearst Way Kanata, Ontario Canada, K2L 2P4

NORPAK LIMITED Bridge Administration Building Suite 101 Oadensburg, New York

Circle 305 on inquiry card.

prints all those ledgers. Each ledger entry contains a reference to the journal page and item number, so there is a complete audit trail back and forth: indeed, the whole thing looks exactly like the demonstration items given in Myer's Accounting for Non-Accountants, which ought to be no great surprise since that's what the programs were designed to do.

Now note: the programs do not give a lot of "special reports." They don't claim to do a darned thing that isn't covered in the Myer book (which is still in print, published by E. P. Dutton, 1980). But they do create books that look like what accounting texts expect, which was all I set out to

And since my business gets confused with my family's affairs, I've made it easy to segregate business from family expenditures (for example, cases where the kids come on business trips and thus have to have their expenses charged to a different

account from mine. That sort of thing).

I've used these programs since 1977. Eventually some of my friends asked for copies. Then more. Then I was asked to write up a little manual on how to use the programs, and while I was at it, why not include a brief treatise on what accounting is for and. . . .

It was getting out of hand, and one night over the slivovitz, Barry Workman got at me with an offer to publish the programs. "After all," he said, "they really are the best accounting programs you know of, aren't they?"

"No. Just the best for the kind of small business I operate. I don't know how good they'd be for an outfit that has lots of accounts receivable and accounts payable, or a big payroll."

"I use your accounting programs," Barry pointed out. "And so do a number of your friends. Consulting engineers and a couple of freelance salespeople use it; you know, your programs produce standard ASCII files that can be manipulated to be the input to much more complicated routines if anyone wants more massaging than your stuff gives them."

And so forth. So eventually I agreed, and now I'm in the embarrassing position of reviewing my own software. All I can say on that score is that I do use the programs; they do work for my kind of small business. They are not heavy on accounts receivable and accounts payable; they're far more useful for recording expenses and income in complex ways than they are for controlling monthly billings. (Writers don't have monthly billings.) Given those limits. they are pretty good. They do make books that you can read and that your accountant will recognize. They preserve the audit trail, and they let you have as complex—or as simple a chart of accounts as you like.

My mad friend tells me that my little treatise on why one keeps books in the first place is the only thing on that subject he's been able to make sense of; but do recall that he's quite mad.

#### Use dBASE II Instead?

I described my accounting package to George Tate of Ashton-Tate, the outfit that distributes dBASE II and WRITE, and he recommended that I throw it away and build an accounting system out of dBASE II. I haven't done that and I'm not likely to, but I'll have to confess that I see his point. Every time I play with dBASE II I find something else to like about it; unlike some programs, this one wears well, and I think you really could construct a pretty good accounting system from it. In fact, I know you can because I've seen some of them in operation,

I also have Quickscreen, a "screen builder" program designed for use with dBASE II and Microsoft BASIC. I like Quickscreen, I asked George Tate about it, and he told me a number of his programmers like to use it when they're doing programs in dBASE II, which is a pretty powerful recommendation. Quickscreen lets you build up a form, such as a letter-

#### **COPIES WITHOUT PROBLEMS:**

FAST: Turnaround time in hours and days, not weeks. You get your disks when you need them.

ACCURATE: Each copied track is checked bit by bit. If it doesn't match your original, it isn't shipped.

FLEXIBLE: Standard, double-boot, and copyresistant formats. 50 copies minimum, no maximum.

REASONABLE: Set-up as low as \$10 per disk. Copying only from 30¢, copying and 3M disk from \$2.00. Other disks and services also available.

RELIABLE: Years of disk duplication experience insures a problem-free shipment on time — time after time.

For all your Apple® compatible copying needs.

#### THE ALF COPY SERVICE.



1448 Estes

Denver, CO 80215

[303] 234-0871

head or a shipping label, or anything like that, which includes lines and permanent labels (such as "Bill To:" or "\*\*\*TOTAL\*\*\*") as well as variables. You then save the form on disk, and when you call it again, the form returns with values for the variables from a dBASE II file. It all looks very useful, and the manual seems reasonably clear. I confess I haven't done a lot of experimenting with Quickscreen, but people I respect use it with no trouble.

Next time, more on new hardware, including, I hope, the IBM Personal Computer.■

#### Software Reviewed

Sorcim Corporation

405 Aldo Ave., Dept. A1 Santa Clara, CA 95050

Supercalc CP/M

\$295

Cornucopia Software

POB 5028

Walnut Creek, CA 94596

Microproof correcting option

\$169 \$60

INC. JOHN D. OWENS ASSOCIATES, INC. JOHN

D. OWENS

NHOC

MicroPro International Corporation

1299 Fourth St.

San Rafael, CA 94901

Spellstar (for Wordstar) Apple \$195

Microsoft Inc.

10700 Northup Way

Bellevue, WA 98004

BASCOM compiler for BASIC-80 CP/M and Apple

CP/M and Apple \$395 TRS-80 Model I \$195

Digital Research

POB 579

Pacific Grove, CA 93950

CB80 compiler for CBASIC \$500

Workman & Associates

112 Marion Ave.

Pasadena, CA 91106

CBASIC Accounting 8-inch \$245 for Non-Accountants single-density

CP/M disk

Fox & Geller Associates Inc.

POB 1053

Teaneck, NI 07666

Quickscreen for 56K-byte \$149 FMS-80, dBASE II, CP/M

CBASIC, Microsoft

BASIC-80

#### ADCY.

### A Message to our Subscribers

From time to time we make the BYTE subscriber list available to other companies who wish to send our subscribers promotional material about their products. We take great care to screen these companies, choosing only those who are reputable, and whose products, services, or information we feel would be of interest to you. Direct mail is an efficient medium for presenting the latest personal computer goods and services to our subscribers.

Many BYTE subscribers appreciate this controlled use of our mailing list, and look forward to finding

information of interest to them in the mail. Used are our subscribers' names and addresses only (no other information we may have is ever given).

While we believe the distribution of this information is of benefit to our subscribers, we firmly respect the wishes of any subscriber who does not want to receive such promotional literature. Should you wish to restrict the use of your name, simply send your request to BYTE Publications Inc, Attn: Circulation Department, 70 Main St, Peterborough NH 03458. Thank you.

PERSONAL COMPUTER PERSONAL COMPUTER PERSONAL COMPUTER

### \*\*IBM PC USERS \*

#### SEATTLE COMPUTER RAM FOR IBM PC

64K RAM + BD\$418.128K RAM + BD\$594.192K RAM + BD\$770.256K RAM + BD\$942.64K Chip Kit\$176.

Each RAM card has an RS232 serial port which uses IBM supplied software.

WE EXPORT: Overseas Callers: TWX 710 588 2844, Phone 212 448-6298, or Cable: OWENSASSOC

### JOHN D. OWENS

Associates, Inc.

12 Schubert Street, Staten Island, New York 10305 212 448-6283 212 448-2913 212 448-6298

# 20,000 Programs For The IBM



# Are Now Available Personal Computer!

### INTRODUCING BABY BLUE CPU PLUS

Baby Blue CPU Plus is an accessory printed-circuit board for your IBM Personal Computer and special software on disk.

As far as normal PC DOS operations are concerned, Baby Blue acts just like any other normal, mild-mannered 64K byte random-access memory board.

But when you invoke a CP/M-80\* program, Baby Blue becomes a second computer within your computer, letting you run thousands (literally thousands) of programs written for the CP/M microcomputer operating system.

CP/M, the first microcomputer operating system to gain wide acceptance, has been around since 1975. Not only has it played host to a lot of programs, but those programs are among the most useful, most sophisticated, most thoroughly tested and debugged, most proven programs ever written. More than 200,000 computers were field-testing those programs for you before the IBM Personal Computer even existed.

The total CP/M library is immense. It includes the best efforts of thousands of professional and advanced-amateur programmers. There are time managers, spreadsheet manipulators and professional-office packages. Languages — BASIC, of course, ALGOL, FORTRAN, C, Pascal, LISP, COBOL, PILOT, and FORTH, to name a few. Text editors, text formatters, full-blown word processors, spelling checkers and indexers. Utilities that will massage problem files so that they lie back and purr. Games, including chess, Reversi, Adventure and tournament-level Star Trek. Database managers. Accounting packages that can run a milliondollar business... Just about anything you can imagine.

The net result is an integration of CP/M programs into the PC environment that's so smooth, so transparent that you won't need to know or care which operating system a program was originally written for.

#### **Special Baby Blue Features:**

- Z80B\* microprocessor running at 4.77 megahertz.
- Additional 64K memory, fully available to PC DOS looks just like the IBM 64K board to the system.
- Will accept CP/M programs on any of several popular 5½" soft-sectored diskette formats.
- 63K of user memory is available for CP/M programs 7K more than on any other popular machine.
- Files can be shared CP/M and PC DOS programs can be mixed in a menu-driven system with common data files.
- IBM Personal Computer peripherals are supported including keyboard, video boards, printer, Asynchronous Communications Adapter.

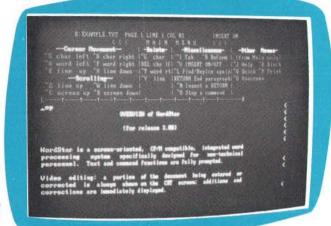
ONLY \$600

Special option — Baby Blue bundled with WordStar\* and Mail-Merge . . . \$980

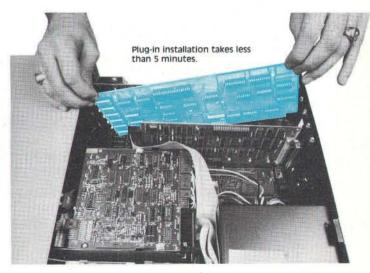
For only \$60 more than the cost of the IBM 64K Memory Board (\$540) you get 64K of Memory PLUS an Interface to over 20,000 programs!

For more information call (212) 247-1400

or write XEDEX Corporation 1345 Ave. of Americas, New York, N.Y. 10105 WordStar\* and Mail-Merge are trademarks of MicroPro International







CP/M is a registered trademark of Digital Research.
WordStar is a trademark of MicroPro International Corporation.
280 is a trademark of Zilog, Inc.
Baby Blue CPU Plus and Baby Blue are trademarks of XEDEX Corporation.

### **Software Review**

### PL/I for Microcomputers

John A. Lehman 716 Hutchins #2 Ann Arbor, MI 48103

named the G subset and was intended

PL/I was originally developed by IBM as the language of choice for the 360 computer series. As such, it was expected to replace FORTRAN, COBOL, ALGOL, and assembler language. The original PL/I was a huge language with more features than a hundred-blade Swiss Army knife. It was inconvenient because it required large chunks of expensive memory and considerable feats of recall on the part of programmers who were trying to remember its features.

Several years ago, ANSI (American National Standards Institute) issued PL/I standards for both a full and a subset language. The latter was

for minicomputer use. It preserved all of the really useful features of full PL/I but cut it down to a manageable size. Implementations are available for most of the popular minicomputers and for any microcomputer that runs CP/M (version 1.4 or later) or MP/M.

Digital Research's PL/I-80 implements all of the level-G features except DEFINED, FLOAT DECIMAL, LIKE, ATANH, DATE, TIME, STRING, and VALID, DATE and TIME are operating system functions that are not supported by CP/M. FLOAT DECIMAL (binary-coded decimal floating-point arithmetic and data storage) is seldom used; FLOAT BINARY (which is supported) is used instead.

The linkage editor (LINK-80), which is included, supports overlays, indexed libraries, and Microsoft .REL files. This means that subroutines compiled under Microsoft FOR-TRAN, COBOL, and BASIC can be used by PL/I programs. (I can only vouch for the FORTRAN features because I don't have the other two compilers.) A version of the Digital Research MAC macro assembler (called RMAC), which produces relocatable code, is included; thus assembler subroutines can also be used. Assembler source libraries to access all CP/M and MP/M system features are included, as is an entire disk of sample programs. A .SYM file is generated, so Digital Research's SID (a symbolic debugger) can be used for debugging with symbolic constants.

#### Performance

As a combined scientific, business, and system programming language, PL/I isn't as elegant as Pascal or as easy to use as BASIC. It does provide most of the facilities of FORTRAN. COBOL, ALGOL (Pascal), BASIC, and assembler language in a form that encourages structured programming. Generally, programs written in PL/I are much more understandable than those written in BASIC, FORTRAN, COBOL, or assembler language (see listing 1). PL/I is not as clear as Pascal, but it has much better facilities for file management and system programming. Its primary advantage as a programming tool is that you can do all of your programming in one language.

This advantage is especially apparent to those of us who use several different computers. I can write a single program in PL/I and run it on my Z80 at home or on the Amdahl, Honeywell, or IBM Series/1 at work. My wife can write programs at home and run them on the IBM 370 OS/VS2 system at work. Any of these programs can also be run on an 8086, a PDP-11, and a NOVA, among others. The only other languages that allow such transportability are FORTRAN and COBOL. I'm allergic to COBOL, and although FORTRAN is my native computer

#### At a Glance

Name: PL/I-80

High-level-language system

#### Manufacturer

Digital Research POB 579

Pacific Grove, CA 93950

#### Price

\$500 (\$35 for documentation alone)

#### Format

Two 8-inch floppy disks Jother formats available

#### System Requirements

CP/M version 1.4 or higher, MP/M, 8080,8085, or Z80 processor with 48K bytes of memory and two 8-inch disk drives (an 8086 version is also available)

#### Documentation

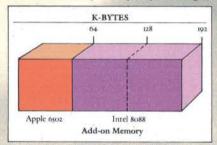
Language manual, operator's guide, applications guide, and pocket reference auide.

Language enthusiasts, applications and system programmers



MetaCard will turn your Apple II personal computer into tomorrow's high performance machine. It triples the memory of your Apple, and at the same time, greatly increases the processing speed with an Intel 8088 16-bit microprocessor. The future for your Apple is built into MetaCard.

Enough Memory to get the Job Done MetaCard has up to 128K bytes of onboard memory with parity. Adding



MetaCard to your Apple's existing 64K bytes of memory gives you three times the capacity, and opens the door to applications never before possible on your system.

Faster Processing Speeds

Speed is just as important as memory. MetaCard is designed to handle all computing tasks at greatly increased speeds. The Intel 8088 operates at the full 5Mhz, running most applications at least 4 times faster than the Apple's iMhz 6502. And MetaCard gives you multiprocessing capabilities, allowing both the 8088 and 6502 to run simultaneously at full speed. Increased processing speeds, interprocessor interrupts and a real-time clock enable your Apple to perform like the machine you want.

Compatibility and Reliability Compatibility has been designed into MetaCard. Metamorphic's processor card runs CP/M-86, which is included with the card at no extra cost. And Metamorphic offers UCSD Pascal 4.0 and the operating system for the IBM Personal Computer as options. Full parity checking, power-up diagnostics and a 48 hour burn-in will insure the reliable

performance of your MetaCard.

Find Out More
Not everyone needs
greater memory and
speed. If you're one
of those who does,
MetaCard is for
you. At an
introductory price
of \$980 for the 64K
configuration, it's

not the least expensive addition you can make to your system, but high performance products never are. Call us today and find out what Metamorphic Systems has in mind for your Apple's future. Dealer inquiries welcome. Metamorphic Systems, Inc., P.O. Box 1541, Boulder, Colorado 80306, (303) 499-6502.

Intel 8088 is a product of Intel Corporation.

Apple II is a registered trademark of Apple Computer Inc.

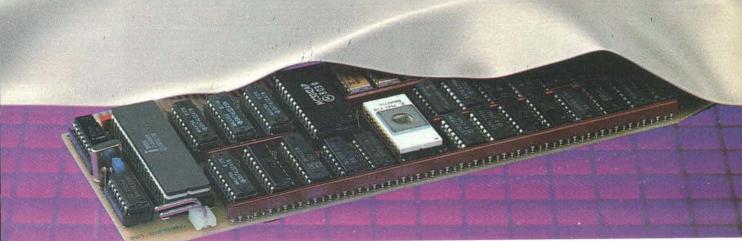
CIP/M-86 is a registered trademark of Digital Research Corp.

IBM Personal Computer is a registered trademark of IBM.

U.C.S.D. Pascal is a registered trade mark of the University of California.

METAMORPHIC SYSTEMS, INC.





### Sinclair Owners.... Expand Yourself! Expand Yourself! I/O Capability for I/O Capability for Your ZX-80, ZX-81.

- 8 Port I/O Board

  Special adapter cable mates to Special edge connector. Sinclair edge connector. Feed-thru accepts Sinclair 16K memory module. memory module.
- memory mousis

  Buffered address lines.

  Separate power supply.

  I/O command with one line of BASIC.

  B-Port bus.
- A/D and D/A

  16-pin cable connects to micro
  developments I/O bus.
  developments; A/D, 0-5V input—
  channels; A/D, 0-5V input—
  D/A, 0-1V output.

  AD \$97
- Clock

  16-pin ribbon cable connects
  to micro developments
  to micro developments
  1/O bus.
  Switchable 0.1 or 1 sec
  resolution.
  Manual or computer control.
  SC \$75
  Beeper.

Complete operating instructions and technical documentation included, \$5.00 documentation charge on all orders.

■ CALL TOLL FREE

800-227-1617 operator 641

(CA, 800-772-3545
operator 641),
These numbers for credit card orders only. For information, write us at:

Box 1140 2000 Center St., Berkeley, CA 94704.

micro developments

**Listing 1:** The HYPOCY program. This sample program shows the easily understood structure of a PL/I program. The program will draw the curves traced by a point on a circle while that circle is rolling internally on the circumference of another circle.

```
hypocy:
     proc options(main);
     /* Plots hypocycloid onto Microchroma 68 */
     /* graphics board using raster addresses which*/
     /* is set up as cp/m punch device. */
     /* polypx and initgr are separately compiled (assembled) */
     /* routines to send groups of dot coordinates and */
      /* to initialize the graphics hardware respectively */
           initgr entry,
           polypx entry (fixed, (0:255) fixed, (0:255) fixed);
     Acl
           (x,y,theta,temp1,temp2,temp3)float,
           (sines.(0:255), cosines(0:255)) float,
           (i,ix(0:255),iy(0:255),count) fixed;
     del
           forty fixed initial(40),
           one hundred fixed initial (100),
           seventy_five fixed initial(75);
   call initgr;
     count=255;
circle:
      do i=0 to count;
           temp3=float(i);
           theta=temp3/40;
           sines(i)=sin(theta);
           cosines(i)=cos(theta);
           x=cosines(i)*seventy_five+one_hundred;
y=sines(i)*seventy_five+one_hundred;
            ix(i) = fixed(x);
            iy(i)=fixed(y);
      end circle;
      call polypx(count, ix, iy);
hypo:
      do i=0 to count;
            temp3=float(i);
            templ=cosines(i);
            temp2=sines(i);
            x=temp1*temp1*seventy_five+one_hundred;
y=temp2*temp2*temp2*seventy_five+one_hundred;
            ix(i) = fixed(x);
            iy(i)=fixed(y);
      end hypo;
      call polypx(count,ix,iy);
      end hypocy;
```

language, it's not suitable for nonnumeric or data-intensive programming.

So much for why you should use PL/I. How well does it work? Table 1 compares run times (in seconds on a 2-MHz Z80) for PL/I-80, Microsoft FORTRAN, and XBASIC (TDL/Xitan Extended Disk BASIC). The test programs were basically textbook examples, iterated enough times to make timing feasible. XBASIC is included to show how an interpreter compared with the compilers.

One hidden "gotcha" showed up in the tests. PL/I interprets numeric constants as fixed decimals and converts them to fixed binary-coded decimals each time arithmetic operations involving the latter are performed. Thus, using constants (rather than variables which have been set to a desired value) will increase the duration of execution by as many as fifty times.

In practice, the only time slow run speeds have presented a problem with PL/I has been during interactive video graphics. Otherwise, a floppydisk-based system is usually so badly disk-bound that the efficiency of the code produced by the compiler doesn't matter much. This characteristic is slightly irritating because both the compiler and the linker make heavy use of the disks; consequently, long programs can take more than five minutes to compile or link. A hard disk would presumably help this. Even so, PL/I-80 and Link-80 work faster with floppy disks than their IBM Series/1 equivalents do with hard disks. They have fewer bugs too.

Version 1.3 of PL/I-80 appears bug-free; at least I haven't found any.



# "WHAT IF..."

Seldom is your first solution to a problem the only one, or the one that's necessarily best to use.

That's why our VisiCalc® program is #1 in the business: the most widely-used business program ever for the personal computer.

It's a powerful "electronic worksheet" that takes the work out of working with numbers. Whether you are working with investments, cash flow, inventory, estimates, budgets, plans—nearly anything numerical, the VisiCalc program will help you work better, smarter, faster.

In just seconds, the VisiCalc program can calculate and display the answers to involved problems you could have spent hours doing by hand.

Its speed and versatility makes it easy for you to explore more alternatives. You can ask "What if?"...just change any number in your problem and instantly, the VisiCalc program recalculates all the numbers and displays the new results. So you can

readily analyze the impact of decisions before you make them.

While the VisiCalc program does a lot by itself, it can do even more for you when used with the other Visi™ programs. That's because they're all inter-related, just like your needs and tasks, to give you a fully integrated solution. For example, automatically bring in data stored in our VisiFile™ program—such as customer or inventory information—for calculation and analysis with your

VisiCalc program.
In addition,
our series
includes the
VisiTrend/Plot,™
VisiSchedule,™
VisiDex,™
VisiTerm,™
VisiPlot,™and
Desktop/
PLAN™

programs.

Ask your retail computer store salesperson for a demonstration of the VisiCalc program. Discover how easy it is to take the work out of working with numbers.





To be a second	D1 11	FORTRANI	E /f	VDAGIO
	PL/I	FORTRAN		XBASIC
10,000 iterations	0.5	0.3		20.8
10,000 fixed-point additions	0.9	0.5		NS
10,000 fixed-point multiplications	6.8	0.5		NS
10,000 floating-point additions	10.0	8.4		48
10,000 floating-point multiplications	15.5	14.9		57
10,000 dummy subroutine calls	0.6	0.6		42
10,000 cosine calculations	35.0	23.0		63

Table 1: The results, in seconds, comparing various languages' performance of standard functions on a TDL/Xitan S-100 system with the Z80 running at 2 MHz. The languages were Digital Research's PL/I-80, Microsoft FORTRAN, and XBASIC (TDL/Xitan Extended Disk BASIC). (NS indicates function not supported.)

Earlier versions had problems that were quickly remedied. Version 1.1 (a major upgrade) was sent out free of charge on disk. Version 1.2 was distributed in the form of a free patch sheet. Version 1.3 (with more upgrades) was available for \$25 on disk to owners of the earlier versions.

#### Conclusions

The current version of PL/I-80 provides a nearly full ANSI level-G system with excellent facilities for linking and overlays. The file format is compatible with Microsoft compilers and thus allows use of existing program and subroutine libraries

with PL/I. Full access to CP/M and MP/M facilities is also provided.

PL/I is a more powerful language than FORTRAN, COBOL, Pascal, or BASIC. This implementation allows access to all commonly used features of PL/I. It's intended to facilitate both applications and systems programming. The current version for microcomputers is remarkably bugfree and is source-compatible with the dialects used on many mini- and mainframe computers. Thus, users can take advantage of existing software or develop software for larger machines on CP/M-based systems. The existence of an 8086 version promises continued compatibility with more powerful hardware.

Support from Digital Research is excellent. The only difficulty commercial users will encounter is the necessity of licensing use of the runtime library in third-party software products. This is offset by Digital Research's assistance program for OEM customers.

#### SAVE \$\$

### DISCOUNT PRIC

#### SAVE \$\$

### apple computer



APPLE COMPUTER SYSTEMS SOLD ONLY IN STORE, CALL FOR PRICES.

#### RAM MEMORY

FOR TRS-80, APPLE II 16K SET 4116's (200 NS)

#### General Information:

We carry a large selection of hardware and software by other companies. Send for our catalog

We are an authorized repair center for APPLE, ATARI, NORTH STAR, AND EPSON.

### ATARI



400 16K	349.00
800 16K	699.00
410 Recorder	89.00
810 Disk	449.00
822 Printer	359.00
825 Printer	779.00
830 Modem	159.00
850 Interface Module	179.00
CX853 RAM	89.00
CX70 Light Pen	64.00
CX30 Paddle	18.00
CX40 Joystick	18.00

#### **VERBATIM DISKETTES**

Box of 10 51/4" 29.50 Box of 10 8" 39.50



ADV-20-64K 3150.00 ADV-1Q-64K-HD-5 5195.00



2795.00 HRZ-2Q-64K HRZ-1Q-64K-HD-5 4695.00 HRZ-1Q-64K-HD-18 6295.00 5 MB HARD DISK 2350.00 18 MB HARD DISK 4195.00

#### PRINTERS

EPSON	200 00
100000000000000000000000000000000000000	299.00
MX-80	469.00
MX-80 F/T	569.00
GRAFTRAX	90.00
INTERFACE (APPLE)	75.00
CABLE (APPLE)	22.50
IDS	
560G	1450.00
PRISM	1795.00
NEC	
3510 35CPS	1995.00
7710 55CPA	2650.00
8023A	599.00
OKIDATA	
MICROLINE 80 MICROLINE 82A MICROLINE 83A	389.00
MICROLINE 82A	549.00
MICROLINE 83A	849.00
MICROLINE 84	1245.00
C.I.T.O.H.	
STARWRITER 25CPS	1595.00
STARWRITER 45CPS	2195.00
FORMS TRACTOR	275.00

PRICES SUBJECT TO CHANGE WITHOUT NOTICE. MARYLAND RESIDENTS ADD 5% SALES TAX

FREDERICK COMPUTER PRODUCTS, INC. TO ORDER CALL:

(301) 694-8884

**5726 INDUSTRY LANE** 

#### Store Hours:

MON. THRU THURS. 9:30 AM-9:00 PM 9:30 AM-5:00 PM FRI. AND SAT.

FREDERICK, MD. 21701

## THE TEC-86 SERIES OF 16 BIT MICROCOMPUTER SYSTEMS

TEC-86 - COMPLETE 16 BIT 8086 MICROCOMPUTER SYSTEM - \$4390

## **FEATURES**

- Two 8 Inch DD Floppy Disk Drives (1.2 MB Total)
- ROM Boot for MP/M-86 IM
- 64K Bytes of Memory
- Vectored Interrupts
- @ 16 Bit 8086 CPU
- Heavy Duty Power Supply
- IEEE 696 S-100



Two RS232 Serial Ports

Baud Rates from 50 to 19200 Baud

Independent Baud Rate for each Serial Port

• 24 Parallel I/O lines (Three 8 Bit Ports)

Attractive Industrial Quality Enclosure

TEC-86M4 — \$7595.

FOUR USER TEC-86 SYSTEM WITH 1/2 MEGABYTE OF MEMORY

## TEC-86W — \$10990.

TEC-86 SYSTEM WITH WINCHESTER 31 Megabyte HARD DISK ONE YEAR
WARRANTY

TEC-86M4W - \$12990.

FOUR USER TEC-86 SYSTEM WITH 1/2 MEGABYTE OF MEMORY AND 31 Megabyte WINCHESTER HARD DISK

## **TEC-86 OPTIONS**

- CP/M-86m Single User Operating System
- Additional Memory, 64K and 256K byte increments up to a system total of one full Megabyte
- Languages
   BASIC-86rm, FORTRAN-86rm, PASCAL-86rm,
   CBASIC/86rm, PASCAL/M86rm, FORTH,
   CIS-COBOL and other High Level Languages

- Double sided double density floppy disks (2.4 MB total)
- 31 Megabyte Winchester Hard Disk
- Attractive Wood Grain Desk Top Enclosure
- Rack Mounted enclosure
- Alphanumeric terminals (80 chars x 24 lines)
- Matrix, correspondence quality, letter quality, and graphics printers

## ANALOG TO DIGITAL DIGITAL TO ANALOG DATA ACQUISITION AND CONTROL BOARDS AND SYSTEMS

## APPLE A/D \$695 w/Timer-Counter

ANALOG TO DIGITAL Converter with Timer/Counter 12 Bit Accuracy, 16 Channels, 30 KHz Conversion, Three programmable Timer/Counters to:

Trigger Conversions
Count Conversions
Count External Signals
Count Bus Clock

Options: Programmable Gain; 14, 16 Bit Accuracy; 40, 100, or 125 KHz; Expansion to 256 Channels

## DIGITAL TO ANALOG CONVERTERS

12 Bit Resolution
3 Microsecond Conversion
Jumper Selectable Outputs
±2.5V, ±5V, ±10V, 0 to
+5V, 0 to +10V
Each operates independently
Each DAC holds previous value
until an entire new word
is presented to it
Fully assembled and tested

## S100 A/D \$765 Analog to Digital Converter with Timer/Counter

12 Bit Accuracy, 16 Channels, 30 KHz Conversion, Five Programmable Timer/Counters for: Time of Day

Time of Day
Triggering Conversions
Counting Conversions
Counting External Signals
Interrupting the CPU

Options: Programmable Gain; 14, 16 Bit Accuracy;

40, 100, 125 KHz Conversion; Expansion to 256 Channels

## OTHER FINE \$100 and APPLE PRODUCTS AVAILABLE, INCLUDING:

ANALOG to DIGITAL CONVERTERS (12, 14, 16 bit accuracy, 30, 40, 100, 125 KHz Conversion rates, 16 to 256 Channels, programmable gain, timer/counters). DIGITAL to ANALOG CONVERTERS (12 bit accuracy, 3 microsecond conversion rate). 8086 CPU Board, I/O Boards 64K/256K Memory Boards, Real-time Video Digitizer and Display. Complete Systems also available for Data Acquisition, Video Digitization, and General Purpose Applications.

REQUEST OUR CATALOG FOR COMPLETE LISTING, AND SPECIFICATIONS ON THE ENTIRE TECMAR PRODUCT LINE.



**DEALER INQUIRIES INVITED** 

TECMAR, INC. (216) 464-7410

23600 Mercantile Rd. • Cleveland, OH 44122

## **Hardware Review**

## Apple II 80-Column Video Boards Five Popular Units

John E. Howland Vanguard Systems Corporation 6901 Blanco Rd. San Antonio, TX 78216

The Apple II computer's video-display section was designed with an ordinary television set in mind. This design choice limited the Apple's screen to 40 characters per line because of the limited resolution of ordinary color television sets. Of course, this arrangement allowed Apple II users the option of using their home television set, rather than requiring them to purchase a more expensive video monitor or terminal. However, as the popularity of the Apple II grew, software developers began to write programs that made applications such as accounting and word processing possible. These applications often require a professional-quality 80-character-per-line display. It's not surprising, then, that several enterprising manufacturers have developed Apple II interface cards to provide the more or less standard 24 lines of 80 uppercase and lowercase characters. (See photo 1, page 256.) I have reviewed five popular interface cards, Omnivision, Full-View 80, Smarterm, Sup'R'Terminal, and Videoterm, and this article surveys their characteristics and compares their features.

All the 80-column boards use a large-scale integration (LSI) device, either Motorola's 6845 or Synertek's 6545, as the "heart" of the display circuitry. Because of this, you might think that the boards would be very similar, but each has different features, and they are not entirely compatible with one another or with the standard Apple II software. Yet they do have features in common: all generate uppercase and lowercase characters and require a good-quality black-and-white monitor (not a black-and-white or color television set) for best results. (See the text box "A Fast Scan of Video Monitors," page 254.)

## Accessing the Boards

All the boards are accessed by using the standard Apple II conventions for getting at peripheral devices. For example, the familiar PR#n instruction, where n is the slot number of the peripheral device, can be used to activate the video boards. The Apple II permits only one peripheral device to be active at a time, so this can pose some difficulties if the board is intended to be used simultaneously with a modem (or serial interface, etc.). Another important consideration is that each board interprets certain control characters as commands to perform special functions. These control characters usually cannot be used by programs for other purposes. Moreover, Integer BASIC does not have the CHR\$ function required to generate the control characters.

Characters are formed on the video display as a matrix of dots within a field of fixed size. (See photo 2, page 257.) Common character sizes are 5 by 7 or 7 by 9 dots. As an example, a character may be formed from a table of dots having 5 columns and 7 rows, within a field of 6 columns and 13 rows. The unused rows and columns in the field provide the spacing between characters on a line and between lines of characters. The lowercase characters g, j, p, q, and y are generally easier to read when they are allowed to extend down into the lower rows.

Usually, 7 by 9 dot characters can be made to have a more pleasing appearance than 5 by 7 dot characters, due to the higher resolution; however, this may not be apparent unless a higher-bandwidth monitor is used. I suggest that you test the video board with the monitor you intend to use to ensure acceptable character appearance.

## The HiNet Local Area Network Because man was not meant to work alone

HiNet is the best way yet to get everybody in your company working together. A HiNet desktop work station puts each person in touch with what everybody else in the office is doing - for little more than the cost of a good typewriter.

"HiNet takes the time out of sharing." SM

Put an end to big-computer backlogs and share data with different departments - or access abundant central files – instantly. You get maximum computing use from your own station or any other station on the network. And you can print on any one of the network's shared printers. There's no need to leave your desk or wait for someone else to assist you!

## No growing pains. Period.

Here, at last, is a system you can't outgrow. With HiNet you can start as small as just two work stations. Add up to 30 stations anywhere you want within your building. And since each low-cost station is a complete computer - not just a terminal - additional stations don't tax the system. They add to its capability.

The friendliest system ever.

HiNet is so compatible that you can enjoy this advanced network technology and continue to use terminals. printers or

other peripherals you may

HiNet is hardware and software - a complete local

area network. Advanced

already have.

security and system integrity. So advanced, yet HiNet can use virtually any CP/M® applications software program in the world.

So simple you can plan it yourself.

Let HiNet demonstrate itself on paper before you buy with the Local Area Network Planning Kit. The Kit will show you how to lay out a network according to your office floor plan. It's easy and it's free! Send for it. See how a local area network can help you accomplish more – and share

efficiently than ever before. Digital Microsystems

information - more easily and

systems' utilities provide NOW WITH THOUSANDS OF the utmost in both data ATIONS AROUND THE WORLD.



HINET IS COMPLETE HARDWARE AND SOFTWARE LOCAL AREA NETWORK TECHNOLOGY.

HiNet utilizes 8 or 16 bit processors in single board or Multibus™ configurations; advanced memory management and data storage; high-speed local network data and telecommunications; real time processing redundancy and back-up capabilities; multi-level data security provisions; end-to-end diagnostics and automatic error correction routines; international support and comprehensive training. Specially dedicated stations: print spool, telex or voice store & forward, and graphics. For a catalog and complete specifications contact Digital Microsystems.

CP/M is a registered trademark of Digital Research. Multibus is a trademark of Intel Corporation.

## MICROMAIL OFFERS THE LOWEST PRICES AND PERSONAL SERV

## DEC LA 100

DUAL MODE MATRIX PRINTER CALL FOR PRICE!



LIMITED STOCK

## LA 34 DA...\$849.00 DEC LA 120KSR....\$2049.00 .....\$1399.00 VT 100 ... VT 101. . .. CALL VT 131.....\$1499.00

## TELEVIDEO 910 ..... \$569.00

912								\$6	8	19	.(	00	)
920								\$7	12	5	.(	00	)
950								\$9	)3	19	).(	00	)
925													

ANADEX	./
DP 9500	. \$1149.00
DP 9501/40/.	\$1149.00
DP 9500	\$749.00

## TEXAS INSTRUMENTS

810/2 ..... \$1299.00 (includes upper/lower case option)

810/2 VFC/CP..... \$1499.00

(includes u/l case, forms control & compressed print)

## LETTER QUALITY PRINTERS

## DIABLO

- 630 RO \$1949.00

- . 630 KSR . . . CALL . 620 .
- . 1640 ..... CALL

 SPRINT 9/45 \$1849.00

• SPRINT 9/35 CALL FOR PRICE

## NEC

- 7700 SERIES
- 3500 SERIES

CALL FOR OUR LOW PRICES

## "PORTABLES SPECIAL"

T.I. 745 ..... \$1399.00 T.I. 743KSR .....\$849.00

**★ NEW 3M WHISPER WRITER** CALL FOR PRICE!

**TELETYPE 43** PF(TTL) \$899.00

## **CALL TOLL FREE (800) 854-6028**

To Order: Send check to MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703, Personal or company checks require two weeks to clear. Visa/MasterCard accepted. C.O.D. requires a 15% deposit. Handling: Add 3% to C.O.D. or credit card orders. Add 5% to 15% deposit on C/C and balance C.O.D. NOTE. Handling charges are waived on orders pre-paid in advance by check. Shipping: We ship FREIGHT COLLECT via UPS or Motor Freight. Air and Express delivery is available. Prices subject to change without notice.

## **WE SELL INTERNATIONALLY**

: MICHOMPIL .

P.O. Box 3297 Santa Ana, CA 92703 Phone: 714/731-4338 TWX: 910 595 1146

## A Fast Scan of Video Monitors

The video image produced by the Apple II and many other personal computers is called a raster-scan display. The image is made up of several hundred horizontal lines of several hundred tiny dots. In a normal television picture, there usually are 262 lines per frame and fewer than 200 dots per line. This allows fewer than 40 characters per line. with a 5 by 7 dot matrix. Lines of dots are displayed at the rate of 15,750 lines per second, so the video bandwidth would be 200 times 15.750 Hz. or about 3 MHz.

## Try a test run before you buy

To display a line of 80 characters in a 7 by 9 dot-matrix format would require about 800 dots per line and a video bandwidth of 12 MHz (18 MHz is not uncommon in exvensive units).

Some of the video boards in this review generate acceptable images only on monitors. This means that buying an 80-column board may also necessitate the purchase of a monitor, unless you already have one with enough resolution and bandwidth. Monitors are available through most computer dealers, but stick to name brands such as Hitachi, Amdek (formerly known as Leedex), Motorola, NEC Home Electronics. Panasonic. Zenith. etc.

If you have a monitor but are unsure of its suitability for use with the board you have selected, try a test run in a dealer's showroom before you buy. Keep in mind that some of these 80-column boards use more of the video field, so the height and width controls may need to be adjusted.



## Invest in an M System

"Okay, which entry-level, singleuser microcomputer should I own?" The BOS M System.

"Which multi-user system should I own?"

The BOS M System.

"If I want a larger system with the ultimate in performance and capacity, what should I own?"

The BOSM System Multiprocessor.
"How much more does it cost to
own a single-user set-up and
upgrade it, than to start with a

larger system?"
Not a penny more.

"Can I have diskette, tape, and large rigid disk storage?" Yes. "How about really good accounting

The MBSI\* package (GL, AR, AP, PR, OE/INV, Sales Analysis — all in Cobol) is probably the best available on any system...this is one you have to see to believe.

"How about Word Processing?" WordStart, and others.

"Can I run all the other software I've seen?"

Yes, if it's CP/M\*\*\* compatible, almost certainly!

"Will I have to change the operating system when I expand?"
No, with BOS/TURBODOS\*\*\*\*, just upgrade it.

"Well, this is important...will service be available when I need it?"

Yes, with a large dealer network, strategically placed maintenance depots, and fast factory repair turn-around.

"Sounds great! But isn't it too good to be true?"

No...and it's not even expensive! So, why take a chance with somebody else?

"Okay, how can I get one?"
Contact your dealer, systems
house, or consultant — or call us
toll-free!

Dealer and OEM Inquiries Welcome

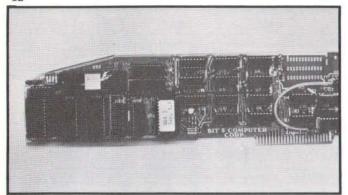


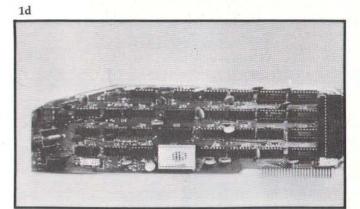
Business Operating Systems, Inc. 2835 East Platte Avenue Colorado Springs, Colorado 80909 In Colorado Call: (303) 634-1541 Toll Free Number: 1-800-525-3898 TELEX 45-0647 BOS CSP

APPLICABLE INDUSTRY STANDARDS: S-100 IEEE 696 \* RS 232 HDLC. SDLC. Async. Sync.\* CP/M\*\*\* TURBODOS\*\*\*\* \* 8" soft sactored diskettes \* ANSI X3/B5/15 Tope Cartridge

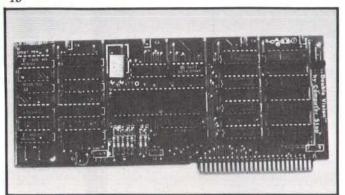
**Photo 1:** Five 80-column video-interface boards for the Apple II computer. The photos are Full-View 80 (1a), Omnivision (1b), Smarterm (1c), Sup'R'Terminal (1d), and Videoterm (1e). Features vary, but most users will need a video monitor to appreciate the full quality of the displays produced.

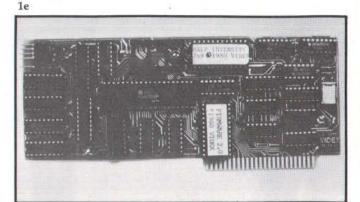
Ta



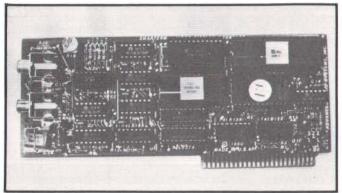


1b





1c



All the boards store the character-dot tables in a readonly memory (ROM). Full-View 80, Sup'R'Terminal, and Videoterm allow an alternate character set to be selected from another ROM or from programmable memory. The alternate character set can be used for foreign languages or for special graphics characters. This is an important feature when special character fonts are needed for word processing or a programming language such as APL.

## Compatibility

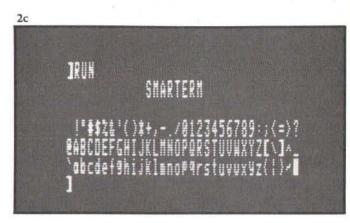
In selecting a video board, software compatibility must be considered, particularly if you plan to use the board with off-the-shelf software packages. Many word-processing packages are customized for specific 80-column boards. If you are already using a particular word processor, you may want to be sure that a version of that program is available for the video board you intend to use. Most dealers can demonstrate the operation of programs with the video board. If a dealer is reluctant to demonstrate a particular program running with a given video board, beware; there may be a problem with that combination.

Program-compatibility problems are usually the result of two conditions: difference in display size and difference in control functions. For example, HOME, VTAB (vertical tab), and INVERSE (black on white) commands are not supported by all the boards. None of the boards reviewed here supports the Flash Mode of the standard Apple II video display. All offer some support for Pascal.

When the system is initially loaded, the Pascal-language system examines interface-slot 3 for a peripheral card. If an interface card is present, the Pascal system attempts to use that interface as its console device. The video boards, therefore, must be placed in slot 3 to be used with Pascal. All the boards support the Z80-based Microsoft Softcard and Digital Research's CP/M. Again, the board must be in slot 3 to be used.

Photo 2: Sample video displays of the five 80-column video-interface boards. Photos 2a through 2e correspond to the 80-column boards in photo 1.





2b **OMNIVISION** !"#\$%&^()\*+,-,/0123456789:;<=>? @RBCDEFGHIJKLMNOP@RSTUVWXYZ[\]^ `abcdefghijklmnopqrstuvwxyz{¦}~∰ 2d Kik SUP'R'TERMINAL **|-#\$2&'()**\$+,-./8123456789:;<=**>**? **@ar:cdefghijkla**hop@rstuv**w**xyz**[\]**^\_ abcde(ghi.ik)mnopgrstuvwxuz(¦}~

When you shop for a video board, you must consider two areas of hardware compatiblity. The first is how the video signal fed to the monitor is switched between the video board and the Apple II's normal display output. The second is how uppercase and lowercase characters are entered from the keyboard.

Full-View 80, Smarterm, and Videoterm support either a manual video-signal switch or a software video-signal switch. The software switch, however, requires modification of the existing software because the BASIC commands TEXT, GR, and HGR are not compatible with it. A similar problem is encountered with the Pascal Turtlegraphics unit. The boards can, of course, be used with two video displays. If this is done, both monitors can display information at the same time. If color graphics or simultaneous high-resolution graphics and 24 by 80 text displays are desired, then two monitors must be used, and video switching is not a problem.

The Apple II keyboard is a teletypewriter-compatible keyboard, but it does not generate all of the American Standard Code for Information Interchange (ASCII) character codes. In particular, the lowercase alphabetic characters and certain special characters, such as {, }, and [, cannot be generated. The video boards use a control character, such as ESC A (two keystrokes, the 2e K VIDEOTERM !**\*#\$%&**\*()**\$**+,-./0123456789**:;**<=>? <del>eabcdefgh</del>ljkl<del>m</del>hopgrstuvwxyz 'abcdefghijklmnopqrstuvwxyz{|}~#

ESCAPE key followed by an A key) or CTRL-A (one keystroke, CONTROL-A), to indicate that the subsequent character is uppercase. Two consecutive control characters toggle the keyboard into a shift-lock mode.

Such conventions for shifting usually make those control characters unavailable for use by a program. All five boards support a hardware modification to the Apple II computer (which invalidates the warranty) that involves connecting the shift-key switch and the game-paddle connector, pin 4. When this modification is performed, the shift key can be used as with a standard typewriter.

## **MICROPROCESSOR DEVELOPMENT WORKSHOPS**

In a 5-day workshop, you'll follow a microprocessor application from software development through PROM programming on the Tektronix 8550 Microcomputer Development Lab

If you work with editors and assemblers or compilers on a minicomputer or mainframe computer, or you've used a development system for microcomputers, you're already qualified to learn how the 8550 MDL supports the design process.

For schedules and class registration for the Development System in the Design Process Workshop in your area, call Customer Training collect at (503) 642-8951.

\*Microcomputer Development Lists



## At a Glance

### Name

Omnivision

80-column video-display interface for the Apple II or Apple II Plus

## Manufacturer

The Computer Stop 16919 Hawthorne Blvd. Lawndale, CA 90260 (213) 371-4010

## Price

\$295

## **Features**

Character appearance: 5 by 7 dot matrix; inverse video; character generator in programmable memory

### Software

Software on disk, compatible with Integer and Applesoft BASIC, Apple Pascal, and the Microsoft Softcard; Apple cursor editing; supports Pascal type-ahead buffer

### Hardware

Motorola 6845 LSI circuit; light-pen input port; consumes 3 watts

## Omnivision

Computer Stop's Omnivision supersedes an earlier board known as Doublevision. The Omnivision board is, however, completely software compatible with the Doublevision. Omnivision is an 80-character video-display board and the only board reviewed here that does not have its software in ROM. The software drivers are supplied on 51/4-inch floppy disks, one for the standard Apple disk operating system (DOS) and the other for the Pascal-language system. (The Pascal language driver is provided for an additional \$25.) This means that a diskbased computer is required for use of Omnivision. Because the software is loaded into user-programmable memory, rather than ROM, it can be changed easily.

Omnivision supports a lowercase mode in which the ESC key is used to indicate that the next character is capitalized. The sequence ESC ESC enters the shift-lock mode. A hardware shift-key modification, where a wire is soldered to the Apple II's shift key at one end and attached to the Omnivision card at the other, is supported. In addition, Omnivision supports the Microsoft Softcard.

Characters are formed from 5 by 7 dot matrices without lowercase descenders. Neither a software-controlled video-signal switch nor a manual switch is provided. Complete program listings are provided in the documentation, which consists of a 60-page manual.

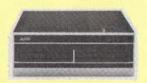


NORTHSTAR

ALTOS

New low price on the incredible Advantage TM. Your choice GDOS and Basic, or GCP/M \$229. Let us burn and test your Horizon or Advantage and we'll back it with our own fast warranty service.

Advantage	Call
Horizon II 64K Quad	\$2895
TSS 18/4	\$8295



Our tech's favorite systems - 8" floppys, hard disks, and multi-user under MP/M or Oasls. Call for prices on Altos' new 16-but systems and 51/4" floppy systems.

10-001 System	is dire 5 % noppy systems.	
8000-2		\$2689
8000-10		\$6375
8000-15.1	2.40	call



The under \$3000 system with the billion dollar name. Systems Include CPU, dual drives, keyboard, monitor, and two serial ports for a printer and modem. CP/M® compatible. 820 w/5" drives \$2375 820 w/8" drives \$2949



The low priced system that's big on features. 4 Mhz Z-80A. real time clack, color output, CP/M® compatible, 5 function keys and more.

PC8001A Computer	\$739
PC8012A I/O w/32K	\$479
PC8013A Dual 51/4" drives	\$739



The new all-in-one that's backed by G.E. Built in CRT, detachable keyboard, 750K formanted, dual flappys, 64K, CP/M® and more. Five software business modules \$695. Televideo 802 \$2795

elevideo 802	\$2795
ele 806, w/10 Meg., Most,	\$5395
elevideo 802H (10 Meg.)	\$5095



The all-in-one that's backed by your local Zenith-Heath Service center, Green Screen, CP/M®, Supercalc, and Basic Incl.

IT POIL		
Z-89 w	/ARK	\$213
7-01 W	40h	3210
7 00 80	w/64K	\$239

## IMPORTS



NEC PC 8023A \$489 Epson MX-80 \$444 Okidata 82A \$469 Epson MX-100 \$719 Okidata 83A w/trac. \$749 Okidata 84 (200 c.p.s.) \$1059

## SOFTWARE

Wordstar - Easy and powerful - the most popular word processing system for micros.

dBASE II - The most popular CP/M based relational database.

MailMerge - Works with or without Wordstar to keep up-to-date mailing lists and create individually producted letters.

Accounting Plus-General ledger, Accounts payable, accounts receivable, etc., plus Condor data base management.

Crosstalk - Plug into the personal computer networks and link-up with other systems via modem communications.

S.A.I.L. CP/M-Foruse with Northstar Horizonsincreases drive capacity 25K on doubles. 50K on Quads.

Software sold only with systems and not warrantied for suitability to particular applications. All require  $CP/M^{\odot}$  - All software sales final.

## LOW COST



Viewpoint w/green	\$544
Televideo 910	\$579
ADM 3A	\$569
Soroc IQ 130	\$589

## HIGH SPEED



 DataSouth DS-180
 \$1269

 Anadex 9501
 \$1244

 T1810 Basic
 \$1359

 Mallbu 200
 call

 IDS 560G
 \$1129

 IDS Prism 80
 \$889

## SERVICE/ORDERING

INTEGRATION: Prices listed are for new equipment in factory sealed boxes with manufacturer's warranty. We will prefest your equipment, integrate your system, configure your software, provide special cables, etc., for an additional charge. Call for prices.

ORDERING: MAIL ORDER ONLY. Prices listed are for cash. No C.O.D.'s. We sell on a net 20 basis to Fortune 500 companies and Universities (at cash prices). Charge cards add 2%. Prices subject to change, product subject to availability. AZ. residents add 5%. Personal checks take 3 weeks to clear. 0-20% restocking fee for returned merchandise. Shipping extra - products are F.O.B. point of shipment. CP/M and MP/M are registered trademarks of Digital Research.

## TELEVIDEO



The state of the s	-	
Televideo 912		\$699
Televideo 920		\$728
Televideo 925	*************	\$735
Televideo 950		\$927

## LETTER QUALITY



F10 Starwriter
40 c.p.s. \$1449
F10 Starwriter
55 c.p.s. \$1649
NEC 3510 \$1895
NEC 7710/7730 \$2340
NEC 7720 \$2695

Zenith 7-25

MPI 99G

Prowriter ACD

numbers.

## \*

CalcStar - Spread sheet analysis which is interactive with the other Micropro packages.

DataStar - Micropro's database system works with Wordstar to combine text and

Scottsdale Systems Ltd.

6730 E. McDowell Road, Suite 110, Scottsdale, Arizona 85257



(602) 941-5856



Call 8-5 Mon.-Fri. (We Export) TWX 910-950-0082 (IMEC SCOT)

## TERMINALS



Falco TS-1 (VT52)	\$1069
Falco (VT-100)	\$1199
Zenith Z-19 (VT52)	\$689
Dialogue 80 Amber	\$895
Volker Craig 404	\$599

## **MORE PRINTERS**

\$1225

\$639

\$719

## DEC LA34AA \$1049 Tally MT 1805 \$1645 Xerox D80 \$2149

## I/O DEVICES

H	ouston Instrument:	
H	i-Plot DMP-2	\$849
Н	I-Plot DMP-7/8	\$2057
Н	Pad DT-11	. \$669

Hayes Smartmodem	\$219
NEC 12"-G Monitor	\$169

# LEARN AP SOFTWARE DESIGN

If you're just getting into microprocessor software design and debugging, this 5-day workshop is just your program.

You'll cover the development system's role in code design, assembling, debugging, software execution on hardware, and PROM programming.

If all this sounds new to you, it won't after you get a week of hands-on experience in the basics of software design and debugging.

For schedules and class registration for the Software Design and Debugging Workshop in your area, call Customer Training collect at (503) 642-8951.



## At a Glance

## Name

Full-View 80

### Use

80-column video-display interface for the Apple II or Apple II Plus

### Manufacturer

Bit 3 Computer Corporation 8120 Penn Ave. S. Minneapolis, MN 55431 (612) 881-6955

## Price

\$379

### **Features**

Character appearance: 5 by 7, 7 by 9, or 8 by 10 dot matrix, lowercase descenders; inverse video; character generator in EPROM; supports alternate character set in EPROM (option: \$47); graphics

### Software

Software in ROM, compatible with Integer and Applesoft BASIC, Apple Pascal, and the Microsoft Softcard; Apple cursor editing; supports Pascal type-ahead buffer

### Hardware

Synertek 6545 LSI circuit; light-pen input port; consumes 2.5 watts

## Full-View 80

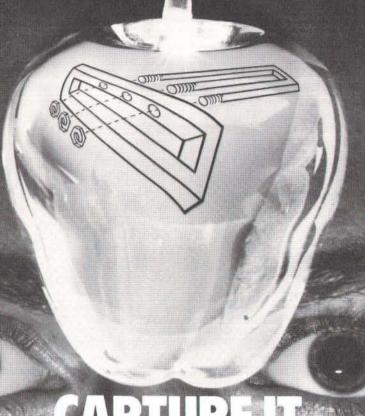
Full-View 80 from Bit 3 Computer Corp. has onboard control software, the latest version being revision 1.2. Software switching of the video signal is supported.

Characters can be formed from 5 by 7, 7 by 9, or 5 by 9 dot matrices (within an 8 by 10 dot framework); however, the 7 by 9 format requires a higher-quality monitor. An optional erasable programmable read-only memory (EPROM) adapter that allows the user to define custom-character fonts is available for \$47. Full-View 80's display fully supports the Pascal-language system and the Microsoft Softcard when used in slot 3. Pascal keypress and type-ahead functions also are supported.

Full-View 80 supports the hardware shift-key modification. Without the keyboard modification, in the lowercase mode a CTRL-A is used to indicate that the next character is uppercase, while the sequence CTRL-A CTRL-A locks the keyboard in uppercase.

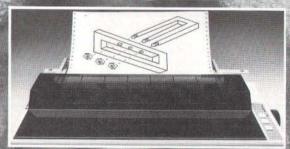
Full-View 80 has escape codes for entering certain frequently used commands such as HOME, CATALOG, LOAD, and RUN with two keystrokes. A stick-on legend for these codes is provided for the keyboard. Full-View 80 has a light-pen input, but a light-pen option is not offered at this time. Also, a 60-Hz nonmaskable-interrupt source is available. This can be used to provide a clock in software. Full-View 80's screen memory can be read by programs. The documentation consists of a 37-page manual; no source code is given.

# 11/1/4



The Grappler™ is the most telligent Apple interface avail-le. Simple commands from the yboard or user program, are all ou need to dump screen graphs to your printer. The Grappler's clusive EPROM chip makes gh resolution graphics that sy. There are Grappler verons to accommodate the nadex, Epson Series,\* IDS iper Tigers, Centronics 739, EC 8023, C. Itoh Pro-writer, cidata 82A,\* Malibu 200, and ture graphic printers.

quires Graphics Upgrade.



ACTUAL APPLE II PRINTOUT USING GRAPPLER AND EPSON MXIGO





3150 E. La Palma, Suite G, Anaheim, CA 92806

(800) 854 8275 TOLL FREE (714) 630 3322 CA; AK; HI.

The Grappler's features include:

- · Graphics Screen Dump
- Inverse GraphicsEmphasized GraphicsDouble Size Picture
- 90° Rotation
- Center Graphics
   Chart Recorder Mode
   Block Graphics
   Bell Control

- · Skip-over-Perf
- Left and Right MarginsVariable Line Length
- · Text Screen Dump.

The Grappier™ works with Pascal and CPM.

## At a Glance

## Name

Smarterm

80-column video-display interface for the Apple II or Apple II Plus

### Manufacturer

Advanced Logic Systems Inc. Suite 1009, 491 Macara Ave. Sunnyvale, CA 94086 (408) 730-0306

## Price

\$360

## Features

Character appearance; 5 by 7 dot matrix; inverse video; character generator in EPROM; graphics

### Software

Software in ROM, compatible with Integer and Applesoft BASIC, Apple Pascal, and the Microsoft Softcard; Apple cursor editing; supports Pascal type-ahead buffer

### Hardware

Synertek 6545 LSI circuit: consumes 2.75 watts

## Apple\* Users Acquire Data And Control Scientific Instruments

## 

ADALAB is a small lab computer system with LARGE capabilities from Interactive Microware, Inc.

ADALAB HARDWARE PACKS MORE POWER. . . for collecting data and controlling your laboratory instruments. It includes a 12-bit analog voltage input, a 12-bit analog voltage output, 8 digital sense inputs, 8 digital control outputs, a 32-bit real-time clock and two 16-bit timers/counters. . ALL ON A SINGLE APPLE INTERFACE CARD!

QUICKI/O SOFTWARE MAKES IT EASY. . . Simple commands in BASIC give you control of all hardware features of ADALAB. Sample programs and easy-touse manuals will enable you to start using your ADALAB system right away. Additional software for laboratory applications is available at extra cost. A complete self-test diagnostic program is included to assure you that all of the hardware is working properly and accurately.

- · Saves time by eliminating manual calculations.
- . Is easy to use because the manuals and software are complete and well
- . Saves money by adding convenience and utility to older instruments.
- · Has a great memory to store and organize experimental data.
- · Is versatile; it works with many different instruments.
- · Is more accurate than a meter or chart recording.

B • Is fully supported by a dedicted team of scientists.

GREAT PRICE/PERFORMANCE. . . the ADALAB **Add-on Package** with interface card, cables, self-test module, QUICKI/O $^{\rm TM}$  software and manuals is available today for ONLY \$495.

Put a complete, reliable computer system in your laboratory FOR ONLY \$3295, including a 48K APPLE II+\* computer, disk drive, graphics/text printer, video monitor and ADALAB Add-on Package.

Send for FREE hardware and software brochures or enclose \$10 for complete manuals. For fastest service, call in your VISA/Master Card order NOW. Dealer inquiries invited! \*Trademarks of Apple Computer, Inc.



INTERACTIVE MICROWARE, INC. P.O. Box 771, Dept. B State College, PA 16801 CALL (814) 238-8294 for IMMEDIATE ACTION

## Smarterm

Advanced Logic Systems' Smarterm board has EPROM-based control software and supports software switching of the screen between video sources. Smarterm generates characters formed from 5 by 7 dot matrices with no lowercase descenders. When used in slot 3, Smarterm supports the Pascal system and the Microsoft Softcard. Keypress and type-ahead are also maintained under Pascal.

Smarterm supports the hardware shift-key modification. Without the shift-key modification, CTRL-A capitalizes the next character when the keyboard is in the lowercase mode. CTRL-Z engages the shift-lock mode. where the keyboard will remain until CTRL-A is entered.

Smarterm has a medium-resolution graphics mode (160 elements horizontal by 72 elements vertical). (Basically, each normal character field is divided into three rows and two columns.) Smarterm can clear the screen, set the screen to black or white, plot points, draw lines, or draw a graphics character at the current cursor position. The documentation consists of a 47-page manual; no source code is given. Smarterm is now distributed by Apple Computer Inc.

## Sup'R'Terminal

The Sup'R'Terminal board from M & R Enterprises has EPROM-based control software and generates characters formed from 5 by 8 dot matrices with true lowercase descenders. Sup'R'Terminal's font tables are stored in programmable memory, rather than ROM, so they can be

## At a Glance

Sup'R'Terminal

80-column video-display interface for the Apple II or Apple II Plus

## Manufacturer

M & R Enterprises Suite E, 285 Sobrante Sunnyvale, CA 94086 (408) 738-3772

## Price

\$375

## **Features**

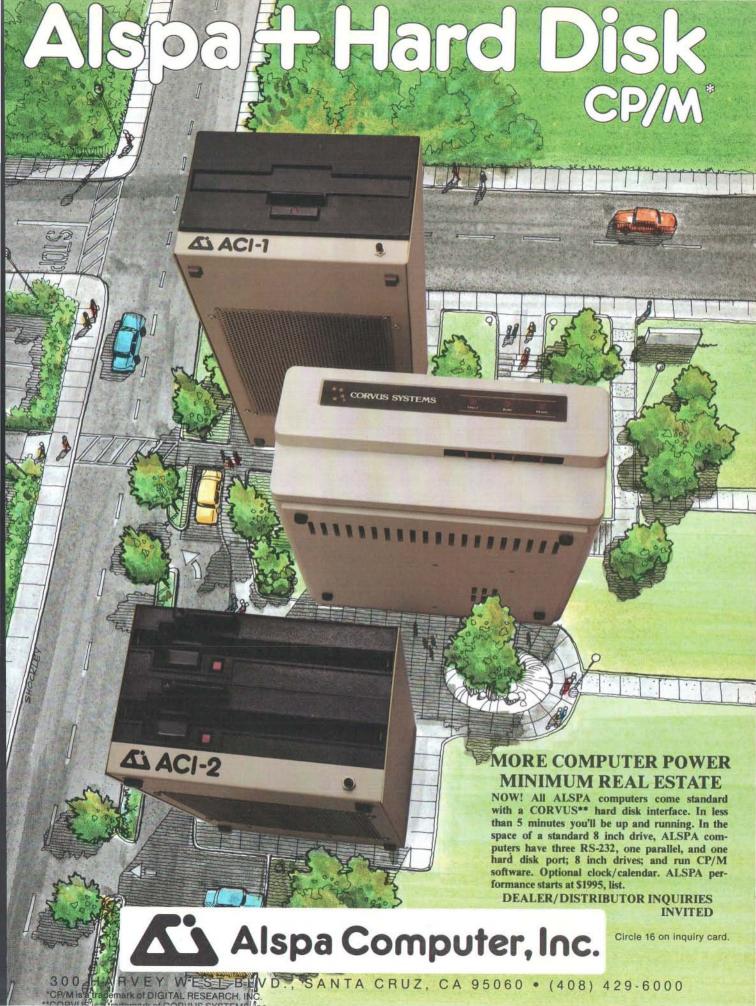
Character appearance: 5 by 8 dot matrix, lowercase descenders; inverse video; character generator in programmable memory; supports up to ten alternate character sets; graphics

## Software

Software in ROM, compatible with Integer and Applesoft BASIC, Apple Pascal, and the Microsoft Softcard; Apple cursor editing; supports Pascal type-ahead buffer

## Hardware

Motorola 6845 LSI circuit; consumes 4.5 watts



## At a Glance

### Name

Videoterm

### Use

80-column video-display interface for the Apple II or Apple II Plus

### Manufacture

Videx 897 Grant Ave. Corvallis, OR 97330 (503) 758-0521

## Price

\$345

### Features

Character appearance: 7 by 9 dot matrix, lowercase descenders; inverse video (hardwired); character generator in EPROM; supports alternate character set in EPROM (option: \$39); graphics

### Software

Software in ROM compatible with Integer and Applesoft BASIC, Apple Pascal, and the Microsoft Softcard; Apple cursor editing; supports Pascal type-ahead buffer

### Hardware

Motorola 6845 LSI circuit; light-pen input port; consumes 2.75

changed easily under program control. Up to ten alternate character fonts for languages and graphics are supported.

Sup'R'Terminal does not support software switching of the video display between the Apple II and its video sources. A manual video switch is not included. Sup'R'Terminal has a special video-balance circuit adjustment that improves the appearance of characters on lowresolution monitors. This circuit tends to correct the difference in intensity between vertical and horizontal lines in a character.

When used in slot 3, Sup'R'Terminal supports the Pascal system and the Microsoft Softcard. M & R Enterprises supplies the source code to provide keypress and type-ahead support for the Pascal system.

Sup'R'Terminal supports the hardware shift-key modification. Without the shift-key modification, CTRL-A capitalizes the next character when the keyboard is in lowercase mode. CTRL-A CTRL-A causes the keyboard to enter a shift-lock mode.

Sup'R'Terminal attaches to the Apple II computer in two places. The main board is inserted into a peripheral slot, while a second, smaller board, which is connected to Sup'R'Terminal by a four-wire cable, is inserted in integrated-circuit location C2. (The C2 integrated circuit must be removed from the Apple motherboard and plugged into the small board.) The documentation con-

## Watch us evolve HERE!!

Finally, a blend of all three generations of MICROCOMPUTERS: (ALL SYSTEMS INTERFACE WITH EACH OTHER)

## PRC-851

- \*8-BIT PROCESSOR
- \*REMOTE RF DATA LINK
- \*BASIC COMPILER
- \*8K ROM
- \*16K RAM AREA
- \*REMOTE PERIPHERAL CONTROL
- \*BUILT-IN MODEM 1200 BAUD
- \*SOFTWARE MODULES
- \*ONE USER CAPACITY
- \*UP TO 64K ROM AREA
- \*HUMAN INTERFACE TERMINAL POCKET SIZED

**RETAIL \$934.95** 

## RM-MS 1686

- \*16-BIT PROCESSOR
- \*REMOTE RF DATA LINK & BUS
- \*EDDIE-86 OPERATING SYS.
- \*32K ROM
- \*128K RAM AREA
- \*DISK DRIVE & VIDEO INTERFACE
- \*BUILT-IN MODEM 1200 BAUD
- \*FOUR LANGUAGE LINKING
- \*THIRTY USER CAPACITY
- \*1MB RAM OPERATING AREA
- \*COMPUTING LINK FOR POCKET UNITS AND MAINFRAME

RETAIL \$3,795.00

## $\mu$ M 32/272

- \*32-BIT GDP
- \*INTERFACE PROCESSOR
- \*ADATM PROGRAMMING
- \*32K ROM
- \*256K RAM OBJECTS
- \*10MB HARD DISK 1.2MB FLOPPY
- \*VIDEO COLOR DOT BY DOT
- \*OBJECT ORIENTED
- \*250 USER CAPACITY
- \*16MB RAM AREA

RETAIL \$24,145.00

DEALER/DISTRIBUTOR INQUIRIES INVITED!!! CONTACT:

## Remote Evolutionary Computers, Inc.

Route #6; P.O. Box 105, Lebanon, Tennessee 37087

ADA is a trademark of U.S. Dept. of Defense (ADA Joint Program Office)

## Look What Apparat has for your IBM Personal Computer.



The following add-ons are available immediately:

· 2 Dual Headed 40 Track Drives - (appears as

2 Dual Headed 40 Track Drives — (appears as four) 640K of storage, software patch, easy internal mount. \$630.00
 Combo Card — Parallel printer, ASYNC communication (RS-252), and clock calendar functions, uses only one slot. \$279.00
 2 Single Headed 40 Track Drives — 520K of disk storage, easy internal mount. \$450.00
 48K additional RAM — 27 chips plug into master PC board \$75.00

- master PC board \$75.00
- \*Add-on Memory Card (uses 64K dynamic RAM chips), 64K \$425.00, 128K \$525.00, 192K \$625.00, 256K \$725.00 Prom Blaster Programs most 1K to 4K EPROMS of 25XX and 27XX single or
- multivoltage, personality modules, read/write

software. \$149.00 • Apparat Game Diskette -\$24.95

 Clock Calendar — Features seconds, minutes, hours, day of week, date, month and year,

week, date, month and year, backup battery, leap year and crystal time base. \$129.00

• Prototype Card — 3.5 by 8 inch wirewrap holds 150-14 pin dips. \$29.95

• RGB Color Monitors — Includes cable, 16 color modifications, NEC — \$1,095.00, AMDEK — \$899.00, TECO — \$699.00.

• 3rd and 4th Add-on Drives — Expansion cabinet and ISM compatible drives, cabinet

cabinet and IBM compatible drives, cabinet and 1 drive — \$499.00, two drives — \$749.00

 64K Hardware Print-Spooler — Parallel printer adapter, buffers 13 minutes of output at 80 characters/second. \$399.00.

• EPSON MX Printers - MX-80 (with dot

addressable graphics) -\$499.00, MX-80 F/T - \$575.00, MX-100 -\$775.00

· Verbatim Datalife Diskettes - (5-1/4" 40 track, box of 10) \$24.95

 16K Memory Kits (9 chips) — \$25.00

• 5-1/4" Flip-Sort - \$21.95

• 5-1/4" Plastic Library Case - \$1.95

Apparat will continue to develop add-on products for your IBM Personal Computer. Call today for more information. Dealer inquiries

303) 741-1778



4401 So. Tamarac Parkway, Denver, CO 80237 (303) 741-1778

"ON GOING SUPPORT FOR MICROCOMPUTERS"

Circle 22 on inquiry card.



sists of a 29-page manual that does not contain the firmware source code but does have many sample BASIC and Pascal programs. One interesting BASIC program converts control codes for Apple II Applesoft programs to the control codes required by Sup'R'Terminal.

## Videoterm

Videx's Videoterm board supports software switching of the video display as a \$35 option; in addition, a manual video switch is available for \$19. The board has a light-pen input and supports an optional alternate character-generator EPROM (\$39) of which several are available. (A special half-intensity character generator gave particularly good results on several monitors during my tests.) Characters are generated from a 7 by 9 dot matrix, and lowercase letters have true descenders.

When used in slot 3, Videoterm is compatible with the Pascal system and the Microsoft Softcard. Without the Videx Enhancer II (which, among other things, modifies the Apple keyboard to allow the shift key to work), CTRL-A is used to toggle between the lowercase and uppercase modes. If the video-switching option is installed, the standard single-wire shift-key modification to the Apple keyboard allows Videoterm to recognize both up-

percase and lowercase letters via the shift key.

The documentation consists of a 141-page manual that includes firmware source code, many programming examples, and schematics of the board.

## Conclusions

Which board should you buy? Unfortunately, the decision is not an easy one because no board outshines the others when all features are considered. I recommend that you have the entire package you intend to use demonstrated, including the display board, monitor, software, and other peripherals. Failure to consider all the components as a unit could lead to additional expenditures for a monitor and software updates. The newer boards (i.e., Full-View 80 and Smarterm) feature software-controlled video-source switching. This feature offers greater user convenience because multiple monitors or manual switches are not required. Having to flip a switch, and not knowing when, can be a source of confusion for the novice. Videoterm's half-intensity charactergenerator EPROM offered one of the most legible character sets of all the boards tested. The final choice, of course, is yours. You will be most successful if you have your retailer demonstrate the entire system.

## More Apple 80-Column Boards

Gregg Williams Senior Editor

Two new Apple 80-column boards have recently been introduced. Here's a brief look at both of them.

## Vision-80

Vista's Vision-80 board for the Apple (originally designed in Australia) is a very refined 80-column board. In fact, I've seen the Videoterm, Omnivision, Vision-80, Full-View 80, and Wizard-80 boards, and I'm most impressed with the Vision-80 because of the many things it does. Its two most interesting features are the retention of standard Apple commands associated with manipulating the 40-column Apple II text window and its ability to be used as an intelligent terminal.

First, the prosaic stuff. Vision-80 (see photo 1a, page 268) supports most Apple peripherals, including the Apple Pascal card and the Microsoft Softcard. Vision-80 must be placed in Apple slot number 3. Its software is in erasable programmable read-only memory (EPROM), although the source code for it is not given in the documentation. It supports a shift-key modification that allows the Apple keyboard to produce both uppercase and

lowercase letters, but there is no provision for toggling between uppercase or lowercase if the shift-key modification is not made. The video monitor connected to the Vision-80 can display the 80-column screen or the standard 40-column text and low-resolution or high-resolution graphics screens under software control. The characters are formed in a large 9 by 10 grid (see photo 1b).

One of the problems with all of the 80-column boards except Vision-80 is that they do not respond properly to many of the text-screen manipulation commands common to many Applesoft and Integer BASIC programs. This means, for example, that when you use 80-column video board X with a given program, you may have to go into that program and replace, say, all occurrences of the HOME command with PRINT CHR\$(25) because that is what board X recognizes as a command to clear the text screen and home the video cursor. Vision-80 does not respond to all text-screen manipulation commands used by the Apple, but it does respond to far more than any other board. The commands it responds to include HOME, TEXT, GR, HGR, HGR2, POKEs to the text-window

The UniFLEXTM
Operating
System
extracts

Coperating
System
extracts

Coperating
Coperati

## from the 8 bit 6809 microprocessor allowing it to outperform many 16 bit systems

With the UniFLEX™ Operating System, the 8 bit 6809 microprocessor can perform as well as larger CPUs in a multiuser, multi-tasking environment.

Independently developed from the ground up, UniFLEX™ closely models the features found in the UNIX™ Operating System. And In two years of use, UniFLEX™ has proven the abilities of the 6809 to perform large system functions when incorporated into a properly designed mainframe.

Some of the features supported include:

- full multi-user, multi-tasking capabilities
- · hierarchical file systems
- device independent I/O
- four Gigabyte disk capacities
- full file protection
- inter-task communication via pipes
- I/O redirection
- task swapping for efficient memory usage
- full random-access files
- comprehensive shell command language
- foreground-background jobs
- · electronic mail and printer spooling
- system accounting facilities

The support software currently available for use under UniFLEX™ is extensive.
A sampling of the programs available includes:

- native C compiler (full implementation)
- native Pascal compiler
- FORTRAN 77 ANSI Subset compiler
- COBOL compiler with ISAM files, Report Writer & Sort/Merge
- Extended BASIC interpreter
- Extended BASIC precompiler
- text editing and processing software
- enhanced printer spooler
- variety of absolute and relocatable assemblers
- debug and diagnostic packages

Technical Systems Consultants, Inc. also offers a line of single user FLEX™ software products for 6800 and 6809 processors. For those having an absolute need for a 16 bit processor, UniFLEX™ will be available through OEM licensing arrangements for the 68000 microprocessor. Please call or write for additional information on individual products or OEM licensing arrangements.

UNIX™ is a trademark of Bell Laboratories. FLEX™ and UniFLEX™ are trademarks of Technical Systems Consultants, Inc.



111 Providence Road Chapel Hill, North Carolina 27514 (919) 493-1451

Send today for our NEW full-color 56-page catalog with continuous checks, statements, invoices, stationery, envelopes, supplies and accessories. We will also send our FORMS SELECTOR GUIDE, to help you find the right forms for your software.

- Quality products at low prices
- Available in small quantities
- Fast Service
- Money-Back Guarantee
- Convenient TOLL-FREE ordering

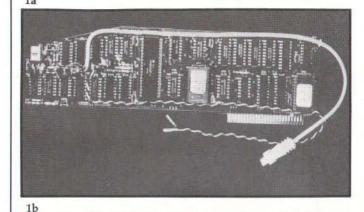
Fast Service by mail or. . . PHONE TOLL FREE 1 + 800 - 225 - 9550

Mass. residents 1 + 800-922-8560 8:30 a.m. to 5:00 p.m. Eastern Time Monday - Friday

IAME	
OMPANY	
TREET	
TITY, STATE and ZIP	
HONE	
fardware and Software being used.	
Nebs Nebs	CODE 22460

78 Hollis Street, Groton, Massachusetts 01471 A division of New England Business Service, Inc.

Photo 1: The Vision-80 board (1a) and video display (1b).



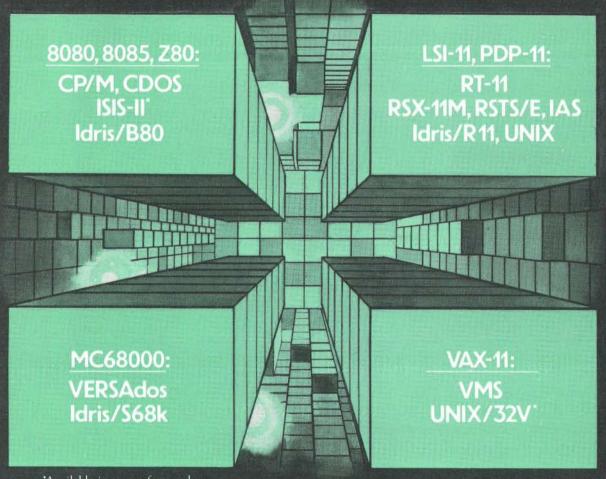
VISION-80 .iklmnoporstuvexvz{¦}%6

values in memory locations 32 through 35, ESCAPE SHIFT-P (same as HOME), ESCAPE E or CHR\$(29) (clear to end-of-line), ESCAPE F or CHR\$(11) (clear to end-of-page), TAB, HTAB, VTAB, INVERSE, NORMAL, the cursor movement and copying keys (right-arrow, leftarrow, ESCAPE A through ESCAPE D, and ESCAPE followed by I, J, K, or M), and CONTROL-S for stopping output to the video screen. In addition, you can switch between text and graphics screens under software control and you have a choice of six cursors (cursor shape can be either a block or an underline and it can be slow, fast, or no blink, a total of six combinations).

An interesting feature of the card is that it can be used with an acoustic modem and either the Apple Communications Card or the California Computer Systems Serial Card to make an intelligent terminal that can operate at data rates of up to 1800 bits per second. With a 48K-byte disk-based Apple, all available memory (about 33K bytes) can be used as a text buffer to store incoming data. Within the "communication option" (as it's called), the board can communicate with the disk operating system (DOS), which allows the saving and transmitting of files. If the remote computer is another Apple II with a Vision-80 board, your Apple can control itself and the remote Apple—potentially a powerful feature. The only thing bad that can be said about this feature is that it is not an option on the board. I'm sure it adds to the board's \$395 price tag, and you may not want to pay for it if you do not need communications capabilities or if you already have them (e.g., in a Hayes Micromodem, which is incompatible with Vision-80).

## C is better than ever.

Whitesmiths, Ltd. is now shipping Release 2.1 of our highly acclaimed C Compilers for ten different operating system families on four architectures:



'Available in source form only.

Idris is a trademark of Whitesmiths, Ltd. ■ UNIX is a trademark of Bell Laboratories ■ CP/M is a trademark of Digital Research ■ RSX-11M, RSTS/E, RT-11, LSI-11, VAX, and VMS are trademarks of Digital Equipment Corporation ■ VERSAdos is a trademark of Motorola Inc.

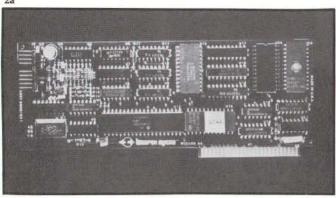
We've added optimizations, sped up runtime routines, and (ahem) fixed all known bugs. The portable C library is more extensive than ever, with new math functions, pattern matching routines, and support for Ada-style exception handling. And it's easier than ever to interface to new environments.

Native compilers are only \$750, including shipping in the continental U.S. Cross compilers, for most combinations of host system and target machine, are \$1350. A Pascal Compiler may be included for an additional \$200. Old customers may upgrade for just half of the new price. And maintenance is now only 25% of the license fee per year.

Now's the time to write or call.

Distributors: Australia, Fawnray Pty Ltd. P.O.B. 224 Hurstville NSW 2220 570-6100 Japan, Advance Industries, Chiyoda-ku, Tokyo 03-258-0839 United Kingdom, Real Time Systems, Newcastle upon Tyne 0632 733131

2a





## **TELEPHONE VOICE RESPONSE**

The V100 interactive voice synthesizer

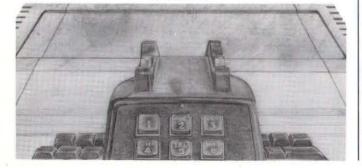
with telephone interface is an Apple II® or IBM Personal Computer® compatible, low-cost, solution to remote data base access arrangements.

V100-A

- Direct telephone connection, auto-dial/answer
- Touch-tone® generation and detection
- Includes 1000 word, LPC allophone vocabulary
- Software for sentence/library construction
- Expandable with 300 (\$150) or 1300 (\$495) high quality LPC words

VYNET CORPORATION

2405 Qume Dr., San Jose, CA 95131 (408) 942-1037



## Wizard-80

Wesper Micro Systems' Wizard-80 board is an adequate 80-column board, but it has a few problems and lacks any outstanding characteristics that would distinguish it from many other Apple 80-column boards. One nice feature is the "medium-resolution" style of blackand-white pixel graphics that the board offers. Each character can be divided horizontally into three square pixels, giving a resolution of 72 rows of 80 pixels each. However, the Smarterm offers the same kind of graphics, but with higher resolution: 72 by 160.

The prosaic stuff is as follows. Wizard-80 (see photo 2a) supports most Apple peripherals, including Apple Pascal and the Microsoft Softcard: to work with them, the card should be placed in Apple slot number 3. Its software is in EPROM, and the source code is provided in the documentation (along with a schematic of the board). The board allows shifting between uppercase and lowercase letters with a CONTROL-A, but it has no provision for working from the shift key. There is no provision for mechanically or electrically switching the 40- and 80-column displays to the same monitor. Characters are formed in a 7 by 9 grid (see photo 2b), and the board can display either 18 or 24 lines of 80 characters each: the 18-line mode is a good feature that often makes text more readable.

Wizard-80 has some interesting features, including the medium-resolution graphics I mentioned and a set of 16 geometric characters that can be used to draw lines, corners, and grids (e.g., to draw the outline of a sheet of paper). It allows inverse video and some of the textscreen manipulation commands used in Applesoft and In-

## At a Glance

## Name

Vision-80

80-column video-display interface for the Apple II or Apple Plus

## Manufacturer

Vista Computer Company 1317 East Edinger Santa Ana, CA 92705 (714) 953-0523

## Price

\$375

Character appearance: 9 by 10 dot matrix; inverse video; character generator in EPROM

Software in EPROM, compatible with Integer and Applesoft BASIC, Microsoft Softcard, and Apple Pascal; supports Apple cursor editing and most Apple screen-manipulation commands

## Hardware

Hitachi HD46505 LSI circuit

## At a Glance

## Name

Wizard-80

80-column video-display interface for the Apple II or Apple II Plus

### Manufacturer

Wesper Micro Systems 14321 New Myford Rd. Tustin, CA 92680 (714) 730-6250

## Price

\$295

## Features

Character appearance: 7 by 9 dot matrix; inverse video; character generator in EPROM

### Software

Software in EPROM, compatible with Integer and Applesoft BASIC. Microsoft Softcard, and Apple Pascal

## Hardware

Uses Hitachi HD46505 LSI circuit

teger BASIC programs, including ESCAPE SHIFT-P (to clear the screen and home the cursor); ESCAPE E and ESCAPE F (or CHR\$(29) and CHR\$(11)) to clear to endof-line and end-of-screen, respectively; CONTROL-S to stop video output; right-arrow, left-arrow; and ESCAPE A through ESCAPE D to control the cursor. One feature not found on some other 80-column boards is a goto-xy control code that lets you position the cursor anywhere on the screen under program control.

Two program bugs were found in the Wizard-80 board. The first is that the board does not respond to one

of the two codes that are supposed to move the cursor up. The board responds to ESCAPE D (as does the unaugmented Apple II), but it doesn't respond to CONTROL-SHIFT-O (as stated in the manual). The second bug occurs when you SAVE or DELETE a command to the disk—the board does not go to the following line to receive your next command but, rather, receives it on the same line. Although the Apple does not malfunction because of this, it is a bug that is definitely there. (The board was tested on two different revisions of the Apple II to verify the validity of these bugs.)

The most serious flaw of the Wizard-80 is too many poor design decisions related to human interaction with the keyboard (which, after all, is the major way that you interact with your Apple). Of the 16 geometric shapes available from the board, four are not available from an unmodified Apple keyboard (although they are available if your Apple has one of several "extender" boards that add features to the keyboard); these shapes are available only through program control (e.g., through the CHR\$ function in BASIC).

Another problem is the cursor control keys. It is to Wesper Micro Systems' credit that the board responds to the standard Apple ESCAPE A through ESCAPE D keys (each a two-keystroke sequence), but the more convenient ESCAPE followed by I, J, K, or M method was not implemented (the four letters form a diamond shape that indicates the direction of cursor movement). Wesper did implement control keys to do cursor movement, but chose CONTROL-SHIFT-O for cursor-up, CONTROL-U for cursor-right, CONTROL-J for cursor-down, and CONTROL-H for cursor-left. If you look at the relative layout of those keys on the keyboard, you'll see that they bear no relation to the cursor-movement direction. I believe that here, as in several other places, the designer was more concerned with making the board easy to implement than with making it easy to use.

## **Industrial** marketing problems?

Regardless of what marketplace you are staking out, its position or size, we can help you draw a precise circle around it

Why? Because as the leading business/technical/professional publishing company, we probably already know your market and can apply our expertise to your research needs.

Give us a call. Phone Ann Graham-Hannon at 212-997-6401 or write her as Director, Marketing Research, McGraw-Hill Research, 1221 Avenue of the Americas, New York, NY 10020.

## Call McGraw-Hill Research



If it's a marketing research problem, we probably pioneered the solution.

# WE'RE STILL



● 64K internal memory. ● Up to 1.5

Megabytes of dual disk storage — easily expandable to 10 Megabytes. ● Twin RS-232 serial ports. ● A CP/M† disk operating system. ● Two 4 MHZ Z80A Processors for faster response. ● A Full 80 x 24 line display on a 12-inch non-glare screen. ● Optional graphics capability.

## **SUPERBRAIN**

It used to be that buying a microcomputer was a simple task. There were only two or three manufacturers offering them and comparing prices and specifications was easy to do. Today, Intertec is no longer one of a handful of microcomputer vendors trying to attract your attention, but... we think we're still the best. And for a good reason.

Consider pricing. Our customers tell us we're still the price/performance leader in single-user and multi-user micro-computer systems. Ask around. Most folks (and even some manufacturers) will concede that point. What a lot of people

do not know is that Intertec may very well offer the best customer protection programs in the industry. What is customer protection? It's a totally new, comprehensive product and customer support program which virtually guarantees your long term satisfaction with every new Intertec product you buy. It means that if you are not satisfied with your Intertec purchase, you can get your money back at any time during the original factory warranty.\* Or, in the unlikely event your equipment should become inoperative during the first few weeks of the warranty period, we will

# 



workstations available. • 64K Internal memory in each workstation. A CP/M† operating system.

● 10 - 384 Megabytes of auxiliary disk storage.

## COMPUSTAR"

replace it for you! And we'll even provide a reimbursement allowance to cover your cost of returning the system to us.

Go ahead. Review the pricing and performance specifications of all the microcomputers available today. We think you'll agree with us. . . ours are still the best! If you want uncompromised performance, competitive pricing, sophisticated expandable products and just plain peace-of-mind, you'll want Intertec.

Ask your dealer about Intertec's SuperBrain and CompuStar microcomputer systems. Or, call or write us at the address below and get more information on today's best values in single and multi-user microcomputer systems.



2300 Broad River Rd./Columbia, SC (803) 798-9100/TWX: 810-666-2115

Circle 213 on inquiry card.

## More Maze Building

A Pascal program to generate mazes efficiently on a printer.

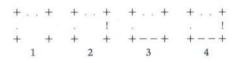
Thomas Edward Neldner 2223 North Quantico St. Arlington, VA 22205

A maze may look incredibly complex, yet it must satisfy just three simple conditions. The maze must have only one starting point and one ending point. All points in the maze must be accessible from the starting point. And there must be only one path from the start to the finish. (For a discussion of the theory behind maze building, see "How to Build a Maze," by David Matuszek, in the (December 1981 BYTE, page 190.)

This article presents a complete program, written in Pascal, to generate mazes on a printer. The program is efficient in terms of speed and memory requirements and may readily be modified to create different kinds of traditional random mazes.

To understand the program, we must first examine traditional mazes with a view toward the efficient storage of a maze within a computer. Each maze is a certain number of "cells" wide and high. A standard cell has four sides and looks like this:

Because the top and left sides of each cell are the bottom and right sides of some other cell, we consider only the bottom and right sides for our purposes here. We then consider each cell as a matrix position in matrix M. Since we are concerned with only two sides, only four different combinations of open/closed sets of cell sides are possible:



The dots indicate "don't care" sides of the cell.

These are the four possible combinations of openings a cell can have and are thus the four possible values a cell can achieve. We are also going to define a fifth value, that of zero or "no value." Such a cell is in a pristine or "frontier" state—it has yet to be touched by the program.

## To Create a Maze

First, a starting position must be created. Since both the start and stop position are immaterial, this merely amounts to printing the word START and a line of "--+" with one opening.

The program in listing 1 starts at an arbitrary position in the maze: the upper left cell. Note that this is not the upper left cell of the matrix; it is rather the M[1,1] cell, assuming subscripts of zero are allowed. M[0,0] would be the actual upper left cell, but this is part of the boundary described later. The program then tests the cells around it, searching for frontier cells. Since there are four directions out of any cell, there are 24 or 16 possible combinations of directions available, which may or may not open onto a frontier cell. The two special conditions are: it is not possible for all neighboring cells to be frontier (we had to get to this cell somehow, thus making the previous cell nonfrontier); and if it is not possible to go in any direction, the path we were creating has come to a dead end—we are stuck.

The first of the nested CASE statements in listing 1 takes one of the 14 remaining possible combinations of directions (it picks randomly) and goes in that direction, making the cell it is moving into nonfrontier. And so the program winds its way through the matrix, "cutting" a path through the frontier cells as it does so. Sooner or later that path will curl up on itself, reaching a point where there are no frontier cells surrounding it.

When this happens, that cell is vacated, and the program goes back to the arbitrary starting cell (the upper left) and once again tests for frontier cells surrounding it. If there is one, the program once again takes off, blazing a trail through the frontier until it curls up and cannot continue. Once again, the system returns to the upper left cell and tests for frontier cells surrounding it. This can happen only a maximum of twice for the upper left cell; after that the program is stuck indeed.

So the program moves one cell to the right of the upper left cell and starts all over again, testing for frontier cells around it. Once again, this can happen only twice, and thus the program continues until it reaches the right-hand end of the line. Note that this is the only case where the pro-

# SPECIAL OF THE MONTH! 16K RAMBOARD 16K RAMBOARD 16K RAMBOARD 16T Apple II Computers

At Consumer Computers we're experts in the business of selling computer products by mail. We have become one of the leaders not only because our prices are better, but because of the reputation we've worked hard to earn. Over the years we have learned what you, the customer, want and need from a mail order company. If we offer any merchandise that you're in the market for, you should seriously compare what we have to offer over the others. Here are just a few of the reasons.

Our helpful salespeople are prepared to meet any currently advertised price on anything we sell (call for details...it's Toll Free!). We pay shipping and insurance charges on prepaid cash orders (with destinations in the continental US). We accept major credit cards for your convenience. If the product you receive is defective, even up to 30 days after you purchase it, we'll repair or replace it and pay for shipping back to you.

Consumer Computers carefully selects

the hardware and software it offers to in-sure that quality is maintained in everything we sell. Our attention to quality is why we can stand behind our policy, because we stand behind our products.

You'll never regret becoming a member of our growing customer family. You have our

## NHC Microcomputer

BUUTA Microcomputer (32K)	
Dual Disk Drives	CALL FOR
I/O unit with 32K ram	
The Wedge 32K Expansion mod	BEST
NEC 8023A Printer	PRICE

## **Gcommodore** PET CBM

8032 Computer with 32K	
4022 Dot Matrix Printer	
4040 Dual Disk Drive (5")	CALL FOR
8050 (5") Dual Drive System	BEST
16K Pet	The state of the s
32K Pet	PRICE



XEROX	Personal
Axion Ramcram 32K Module Asteroids, Missile Comand and Star	
Atari 16K Ram Module	
850 Interface Module	
822 40 col. Quiet Thermal Printer	
825 80 col. 7x8 Dot matrix impact prin	
810 Disk Drive	

//LI10/18	Computers	
820 System with 5-1/4" drives	#	
820 System with 8" drives	CALL FOR	
Xerox 630 (RS-232) Printer		
Forms tractor for printer		
Xerox 820 5-1/4" CP/M 2.2	PRICE	
Xerox 820 8" CP/M 2.2		
Systems Plus software for Xerox	100	

CALL OR WRITE FOR FREE CATALOG

Ordering Information: Phone orders using VISA, MASTER-CARD, AMERICAN EXPRESS, DINER'S CLUB, CARTE BLANCHE, bank wire transfer, cashier's or certified check, noney order, or personal check (allow ten days to clear). Unless prepaid with cash, please add 5% for shipping handling and insurance (minimum \$5.00). California residents add 6% sales tax. Foreign customers please call residents add on sales tax. Foreign customers please call or write for shipping information and charges. OEM's, in-stitutions and corporations please send for a written quotation. All equipment is subject to price change and availability without notice. All equipment is new and com-

plete with manufacturer's warranty (usually 90 days). Showroom prices may differ from mall order prices.

ORDER TOLL FREE **800-854-6654** 

## APPLE II ACCESSORIES



Novation S

Smarterm 80 col card
Corvus Winchester Disk Drives
ALF 3 Voice Music Card
ALF 9 Voice Music Card

Clock/Calendar Card . . . CPS Multi-function Card

Send Orders to:

consumer

ALF 9 Volce Music Card
Alphasyntauri keyboard system
Lazer Lower Case +
Lazer Keyboard Pius +
23 Key Numeric Keypoad by Keyboard Co.
Joystick by Keyboard Co.
8909 CPU Cerd (The Mill) by Stellation.
Al O Sarial 8 Parallel Interface by SSM A&T
DB Master by Stoneware.
Music System (16 voices)
A/D + D/A Interface
Expansion Chassis (8 slots)
Introl/X-10 Controller card
Clock/Calendard Card









0		
W	Hay	/es

Supertalker SD-200	18
Romplus + card	
Romwriter card	14
Symtec Hi-Res Light Pen	
Sup-R-Fan	
Sup-R-Terminal	
SVA ZVX4 Megabyter 8" Disk Controller	
SVA 2 + 2 Single Den. 8" Disk Controller	34
Speechlink 2000 by Heuristics	24
Asynchronous Serial Interface card by CCS	
Centronics Parallel Interface card by CCS	- 11
VisiCalc version 3.3	
VisiFile (NEW data base manager)	17
VisiTrend/VisiPlot	
VisiDex	
VisiTerm	
Desktop Plan II	16
VisiPak (Calc, Trend, Plot, File)	
Easywriter Word Processor	19
Tax Preparer '81 version	
Real Estate Analyzer	
Creative Financing	18
Personal Filing System (PFS)	
PFSReport Peachtree Accounting Software	CAL
BPI Accounting Software	CAL
Systems Plus Accounting Software	CAL
Wordstar by Micro Pro	
DataStar by Micro Pro	
Data diar by micro Fig	
Micro-Sci Disk Drives	
A2 (Compatible with Apple) with cont	46
A2 (Compatible with Apple) with cont	20
A2 (Compatible with Apple) w/o cont	38
A40 with cont	47
A40 without cont	
A70 with cont	59
A70 without cont	49
Micro-Sci Controller card	9
micro-del della cala	1000

## VIC=20 \$249

## VIC ACCESSORIES

K Ram Cartridge for VIC-20\$50	Voice Synthesizer C
K Ram Cartridge for VIC-20\$34	
uperslot\$24	
uper Allen\$24	
upiter Lander\$24	
Praw Poker\$24	
IC Software 6 pack 'A'\$49	
IC Software 6 pack 'B'\$49	
Patasette Cassette I/O Unit	
IC IEEE-488 Interface	
/icmon Machine Lang Monitor	
IC Design Expander	

COMPUTERS Mail Order

8338 Center Drive La Mesa, CA 92041

## VIDEO MONITORS

AMDEK NEC

SANYO

Amdek/Leedex Video 100 12" B&W	129
Amdek/Leedex Video 100G 12" Green Phospher .	149
Amdek (Hitachi) 13" Color w/audio output	389
NEC 12" Green Phospher Display JB-1201M	
NEC 12" Lo-Res Color Display	CALL
NEC 12" HI-Res RGB Color Display	
Sanyo 9" B&W Display	
Sanyo 9" Green Display	
Sanyo 12" B&W Display	
Sanyo 12" Green Phospher display	285
Sanyo 13" Color Display	419
Zenith 12" Green Phospher Display	138



## ACCESSORIES

256 Dynamic Ram Card			CALL
HI-Speed Parallel I/O Card			FOR
HI-Speed Serial I/O Card	 	 	BEST
Real-Time System Clock			PRICES
Card Expansion Chassis	 ere:	 	PHICES

## PRINTERS

C. Itoh Anadex

Qume Integral Data Systems, Inc **OKIDATA** Diablo **EPSON** 

Grappler by Orange Micro Anadex 9501 W/2K Buffer 1289 C. Itoh Starwriter F-10 C. Itoh Starwitter F-10
Epson MX-70
Epson MX-90 & MX-80 FT
Epson MX-100
NCC 8023 Impact Dot Matrix
NCC Spinwitters (Latest models)
Paper Tiger IDS-8600 wigraphics
Paper Tiger IDS-8600 wigraphics
Oume Sprint Dalsywheels (Latest Models) CALL ..629 CALL ..899 .1099 Diablo 630 Dalsywheel 40 CPS

**NEW FOR EPSON NEC PRINTER HI-RES GRAPHICS** INTERFACE

S145

**COMING SOON!** 

ator Interface or Cable M/M or Cable M/M for VIC-20

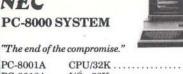
BORNE

outside continental U.S. (714) 698-8088

Telex 695-000 Beta CCMO

```
{$G+}
{2/28/80}
PROGRAM MAZE;
LABEL 190,210,500;
CONST H = 10; W = 23;
VAR Q, Z, A, B, I, J, X: INTEGER;
    M:ARRAY [0..11,0..24] OF INTEGER;
    SEED: REAL;
PROCEDURE L150; BEGIN
   M[I,J]:=M[I,J]-1; J:=J+1; M[I,J]:=4; Q:=0; END;
PROCEDURE L380; BEGIN
   J:=J-1; M[I,J]:=3; Q:=0; END;
PROCEDURE L420; BEGIN
   M[I,J]:=M[I,J]-2; I:=I+1; M[I,J]:=4; Q:=0; END;
PROCEDURE L470; BEGIN
   I:=I-1; M[I,J]:=2; Q:=0; END;
PROCEDURE ONCEWITHSTYLE; BEGIN
   WRITE ('+');
   FOR J:=1 TO W DO
      IF J=X THEN WRITE (' +')
              ELSE WRITE ('--+');
   WRITELN; END;
FUNCTION FNA(X:INTEGER):INTEGER;
BEGIN
   SEED:=SEED*27.36947+31.8723423;
   SEED:=SEED-TRUNC(SEED);
   FNA:=TRUNC(SEED*X)+1;END;
PROCEDURE GETRAND;
BEGIN;
   WRITE ('Please input a number -- any number:');
   READ (SEED); SEED:=ABS (SEED);
      REPEAT SEED:=SEED*13 UNTIL SEED>1;
      REPEAT SEED:=SEED/17 UNTIL SEED<1;
   END;
{INITIALIZATION}
BEGIN; GETRAND;
FOR I:=1 TO H DO FOR J:=1 TO W DO M[I,J]:=0;
FOR I:=0 TO W+1 DO BEGIN
   M[0,I]:=1; M[H+1,I]:=1; END;
FOR I:=0 TO H+1 DO BEGIN
   M[I,0]:=1; M[I,W+1]:=1; END;
   X := FNA(W-2) + 1;
   FOR I:=X-1 DOWNTO 1 DO WRITE (' ');
   WRITELN ('START');
   ONCEWITHSTYLE;
I:=1; J:=1; A:=1; B:=1; Q:=0; M[I,J]:=4;
 {MAIN LOOP}
```

## NEC



PC-8001A CPU/32K	
PC-8012A I/O - 32K\$	490
PC-8023A 100 CPS Printer:	
Friction, Tractor, Graphics \$	485
PC-8031A Dual Disk\$	745
JB-1201M(A) 12" Green\$	159
JC-1202DH(A) 13" RGB Color \$	830
PC-8091A RGB Cable	\$19
PC-CPM CP/M DOS FOR NEC \$	119
PC-GA Gen. Accounting\$	245
PC-AR Acct. Receivable\$	245
PC-INV Inventory Control \$	245
PC-JC Job Cost\$	245
PC-WP Word Processor\$	350
PC-RM 3-D Report Mgr \$	139
PC-32K 32K Card\$	155
PC-SER RS-232 Card	

## PRODUCTS FOR APPLE



AP-16	16K Ram Card\$95
AP-128	128K Ram Floppy \$700
	Bison Drive W/3.3 \$475
AP-B2	Bison Drive Add-On \$365
AP-K6	Konan 6MB Hard Disk \$2265
AP-111	Konan 11 MB Hard Disk\$2750
AP-K11	Konan 16MB Hard Disk \$2970
AP-PAR	Parallel Printer Card\$72

## PRODUCTS FOR IBM

B-B2	Bison Drive-1 Side \$275
B-B3	Bison Drive-2 Side \$465
B-A64	AST 64K Card\$375
B-A128	AST 128K Card \$530
B-A192	AST 192K Card \$710
B-A256	AST 256K Card\$815
B-A2S	AST Dual Serial \$235

20% Discount! - Entire Line.



## CS8000-14S/MTU

208K, 4 USER, Z80A .5M Floppy 40MB Winchester 17MB Tape Cartridge Backup Nationwide Service List .\$15,500 BISON ......\$12,400



2 Serial

2 Parallel

SINGLE BOARD COMPUTER

5"/8" Floppy	Controller (Double Density)	
ust add drive	, power supply, cables, and	CRT ter-
inal		\$900

• Z-80A (4MHZ) · Hard Disk Expansion

· CP/M DOS

## IDEO MONITORS

-AC1	Amdek Color I \$310
-ACII	Amdek Color II - Apple \$Call
-A300G	Amdek 300 Green \$150
-Z12G	Zenith 12" Green\$115
J13	JCS 13" RGB \$625
-J12G	JCS 12" Green \$166



MAIL ORDERS: P.O. Box 9078-184

## Van Nuvs. CA 91409 WILL CALLS:

Sepulveda, CA 91343 (213) 891-5702

Please confirm price and availability by phone prior to ordering.



We accept VISA and Mastercard.



Shipping additional - \$3 minimum Calif. residents add 6% sales tax.

Overseas orders and dealer inquiries accepted.

All merchandise is new and comes with factory guarantee.

## SIERRA DATA SCIENCES

## S-100 BOARDS

Z-80 Master/Slave Single Board Computers

M	laster:	
9	4MHZ	
9	64K	

· Serial

• 4 Parallel

• 16K EPROM

• 8" Floppy Disk Controller (Double Density)

 Winchester Interface S-S4M . . . . . . . . \$690

Slave: Without Disk Controllers S-S4S.....\$625

Winchester Adapter: Uses Micropolis Drives

S-SW ......\$145

## DISKETTES



UII GOOD TITTE AND TO
4" SSSD, HUB \$23.50
"SSDD \$33.00
DSDD\$40.00
,

## PRINTERS



P-MX80	Epson MX100\$405
P-MX80F/T	Epson MX-80 F/T \$515
P-MX100	Epson MX-100 \$685
P-OK82	Okidata 82A \$468
P-OK83	Okidata 84, Serial \$1125
P-PC8023A	NEC PC-8023A \$485
P-PRO	C. ITOH Prowriter, 120 CPS \$485
P-PRO II	C. ITOH Prowriter II \$Call
P-F10	C. ITOH 40 CPS Daisywheel \$1395
AP-PAR	Parallel Int/Cable/Apple \$72

## MicroPro

## SOFTWARE

MP-WS8	Word Star, 8" \$250
MP-WSA	Word Star, Apple
MP-MM8	Mail Merge, 8"
MP-MMA	Mail Merge, Apple \$ 63
MP-SS8	Spell Star, 8" \$127
MP-SSA	Spell Star, Apple \$ 53
MP-DS8	Data Star, 8" \$175
MP-SR8	Super Sort, 8"\$127
MP-SRA	Super Sort, Apple \$100
MP-SII8	Super Sort II, 8"\$105
MP-CS8	Calc Star, 8" \$149

Many additional software packages are available at similar discounts.

## DISK DRIVES

D-S801R D-QDT8	Shugart 801R\$390 Qume DT-8\$495
D-T81	Tandon Thinline 8", SS \$390
D-T82	Tandon Thinline 8", DS \$485

## SIGNALMAN MKI 300BPS MODEM

- RS-232 to Telephone Link, Full Duplex
- Direct Connect, FCC Approved
- 1 Year Warranty
- Low Power Design

M-S300 List . . . . . . \$115 BISON . . . . . \$89

## AB DIGITAL DESIGN LABS 256K BYTE - 128K WORD DYNAMIC MEMORY

- 4MHZ with Extended DMA
- IEEE696, Multi-Layer
- 1 Year Warranty

S-B810A List......\$1245 BISON ...\$975

## STATIC MEMORY SYSTEMS



• 24 Line Addressing

8086

SUPER

MICRO

- · 200NS, Lower Power CMOS
- Intermix RAM and EPROM
- · New Super Low Price
  - S-ST64 List......\$594 BISON.....\$440

• 8 MHZ 8086 S-100 SET • 128K 70NS Static RAM

- DD Disk Controller 22 Slot Mainframe
  - · Cable for 28" Drives MS-DOS (86-DOS)
  - · Add Drives and Terminal!

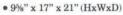
SC-SYS2 System 2 List . . \$4185 BISON . . . \$3450 8086 2 BRD Set w/DOS

SC-2/3 List ......\$795 BISON .......

## QT S-100 & 8" Floppy Drive Mainframe



- +8V@25A/±16V@5A S-100 Power
- +5V@2.5A/-5V@.5A/+24V@3A Drive Power
- · Keyed Power Switch
- Shielded Motherboard
- · Rugged Card Cage



Strappagle 110V or 220V AC

QT-MF6	6 Slot, 2-8" Drive \$525
QT-MF8	8 Slot, 2-8" Drive \$550
OT-MF12	12 Slot 2-8" Drive \$575

## QT S-100 & 51/4" Floppy Mainframe

Similar to 8" Mainframe
Power for 5¼" Drives

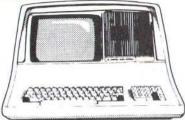
• 7" x 17" x 20" (HxWxD) • 7" x 17" x 20" (HxWxD)



## DRIVE CABINETS

H-BT8	BISON 2 Dr, Vert, 8", Thinline \$245
H-QT8	QT 1 Drive, 8" Vertical \$215
H-OT8-2	QT 2 Dr. Horizontal 8" \$305

# LET US INTRODUCE YOU TO THE COMPUSTAR™ NETWORK.



## AGAIN



## AND AGAIN



## AND AGAIN

Each CompuStar unit offers the CP/M operating system, 64K of RAM and the ability to start as a floppy-based system and grow to 400 megabytes of hard disk storage. Up to 255 units can be linked together in one shared-disk system.

Just the system for the <u>dealer</u> or <u>OEM</u> who wants to make it big in the business market. The versatility and expandability of the CompuStar network lets you answer your clients' needs today and tomorrow. And our low price lets you offer a package they can afford to buy and you can afford to sell.

If networking is new to you, TriStar will give you a proper introduction. We've got software for CompuStar, including accounts payable, payroll, accounts receivable, word processing and database management. Plus we'll help you with your own software development, systems configuration, communications, hardware service, training, installation and any other needs that might pop up.

Because we're experts in networking and support, Intertec® (the manufacturer of CompuStar) has chosen us to distribute this incredible, expandable business system.

For more information on CompuStar and other Intertec products, call (609) 424-4700.



CompuStar is the trademark of Intertec, Inc.

2 Keystone Avenue Cherry Hill, NJ 08003 Listing 1 continued:

```
190: X:=0;
   IF M[I,J-1] <> 0 THEN X:=X+8;
   IF M[I-1,J] <>0 THEN X:=X+4;
IF M[I+1,J] <>0 THEN X:=X+2;
   IF M[I,J+1] <> 0 THEN X := X+1;
CASE X OF
   1:CASE FNA(3) OF
       1:L380;
       2:L420;
       3:L470;
      END:
   2: CASE FNA(3) OF
       1:L150;
       2:L380;
       3:L470:
      END;
   3:CASE FNA(2) OF
       1:L380;
       2:L470;
      END:
   4: CASE FNA(3) OF
       1:L150;
       2:L380;
       3:L420;
      END:
   5: CASE FNA(2) OF
       1:L380;
       2:L420;
      END;
    6:CASE FNA(2) OF
       1:L150;
       2:L380;
      END;
    7:L380:
    8:CASE FNA(3) OF
       1:L150;
       2:L420;
       3:L470;
      END;
    9:CASE FNA(2) OF
       1:L420;
       2:L470;
      END;
   10:CASE FNA(2) OF
       1:L150;
       2:L470
      END:
   11:L470;
   12:CASE FNA(2) OF
       1:L150;
       2:L420;
      END;
   13:L420:
   14:L150;
```

# 9alaky of features

A GALAXY of features makes the LNW80 a remarkable computer. As you explore the LNW80, you will find the most complete, powerful, ready to run, feature-packed personal and business computer ever made into one compact solid unit.

MODEL I COMPATIBILITY – The LNW80 is fully hardware and software compatible with the Model I. Select from a universe of hardware accessories and software – from VisiCalc® to space games, your LNW80 will launch you into a new world of computing.

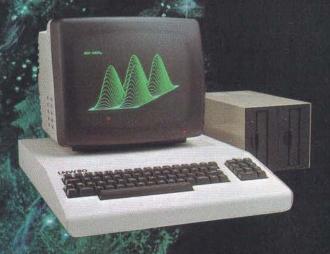
FULLY LOADED – A full payload includes an on-board single and double density disk controller for 5 ¼" and 8" single or double sided disk drives. RS232C communications port, cassette and parallel printer interfaces are standard features and ready to go. All memory is fully installed – 48K RAM, 16K graphics RAM and 12K ROM complete with Microsoft BASIC.

QUALITY CONSTRUCTION – Instrumentation quality construction sets LNW80 computers apart from all the rest. Integrated into the sleek solid steel case of the LNW80 is a professional 74-key expanded keyboard that includes a twelve key numeric keypad.

HIGH RESOLUTION GRAPHICS & COLOR— The stunning 480 × 192 resolution gives you total display control—in color or black and white. The choice of display formats is yours; 80, 64, 40 and 32 columns by 24 or 16 lines in-

any combination of eight colors.

**PERFORMANCE** – Lift-off with a 4MHz Z80A CPU for twice the performance. The **LNW80** outperforms all computers in its class.



Our down to earth price won't send you into orbit

LNW Research Corp.

2620 WALNUT Tustin, CA, 92680 (714) 641-8850 (714) 544-5744

Monitor and Disk drives not included TM Personal Software, Inc.

```
15:GOTO 210;
END; {OF UPPER-CASE STATEMENT}
GOTO 190;
210: IF B<>W THEN B:=B+O ELSE
   BEGIN WRITE ('!'):
      FOR J:=1 TO W DO IF (M[A,J]=2) OR (M[A,J]=4) THEN WRITE ('
                                                    ELSE WRITE ('
      WRITELN:
      IF A=H THEN GOTO 500 ELSE
         BEGIN WRITE ('+');
            FOR J:=1 TO W DO IF M[A,J]>2 THEN WRITE ('--+')
                                          ELSE WRITE ('
      WRITELN; B:=1; A:=A+1; END
      END:
I:=A; J:=B; Q:=1; GOTO 190;
500: X:=FNA(W-2)+1; M[H,X]:=M[H,X]-2; ONCEWITHSTYLE;
     FOR I:=X-1 DOWNTO 1 DO WRITE ('
                                        '); WRITELN ('STOP');
END.
```

gram will intentionally enter a nonfrontier cell.

Now the program has finished the first line of the maze. It is no longer possible for any more work to be done to this line because there are no longer any frontier cells surrounding any cell on the line. So the system prints the top line.

Now the system moves to the leftmost cell of the second line of the maze and does exactly the same thing over again for this new line. And so the program continues, left to right, top to bottom, creating and printing

When the program has completed

the maze-but before it has printed the last line-it is time to make the exit. The program randomly picks a spot on the last line of the maze and blows a hole through the bottom of the maze pattern, thus creating the stop point. The last line is printed, then the STOP message, and you have a maze with only one solution. See listings 2a and 2b on page 282 for a sample maze and its matrix.

## Additional Comments

The program makes a boundary by setting the outer rows and columns of the matrix to 1, making them nonfrontier. This method wastes the outer limits of the matrix and decreases the size of the maze but is much faster than any kind of numeric subscript out-of-bounds checking since the program logic treats these outermost nonfrontier cells as offlimits territory. Therefore it won't go beyond them and cause a subscript error. Note that this requires a maze of 10 by 10 to actually be stored in a 12 by 12 matrix. Naturally, the percentage of memory required as overhead to store these outermost values goes down rapidly as the size of the maze increases, so this method becomes highly efficient with very large mazes.



## New! TI LCD Programmer.

## Hexadecimal and Octal Calculator/Converter.

The brand new tilt-top TI LCD Programmer can save you hours of work. It was designed specifically for the problems you do, and has features that make it ideally suited for applications in computer programming, debugging, repair and digital logic design.

 Performs arithmetic in any of three number bases — OCT, DEC, HEX.

Integer, two's complement arithmetic in OCT and HEX.

One's complement capability in OCT and HEX. Converts numbers between OCT, DEC and HEX.

· Fifteen sets of parentheses available at each of four processing levels.

Logical functions AND, OR, EXCLUSIVE OR and SHIFT operate bit by bit on OCT or HEX numbers.

Unisource Electronics has committed to buy TI's initial production of this unique product. Availability is limited! Order now.

## 15-Day Free Trial.

The best way to evaluate the TI LCD Programmer is to try it yourself - on the - for 15 days. If you're not 100% satisfied, simply return it for a full refund. Order now by calling toll-free:

1-800-858-4580 In Texas call 1-806-745-8835



Just give us your name, shipping address and Visa or MasterCard number and we will charge the tax deductible\* \$75.00 purchase price, plus \$2.00 shipping and handling (Texas residents also add 5% sales tax) to your account. Or send your check or money order to:

Unisource Electronics, Inc. P.O. Box 64240 . Lubbock, Tx. 79464

\* When used for business.

## Color output for \$1995 . . . and less.

The Prism color printers from Integral Data Systems give you great

color hard copy for less than you'd pay for most other quality colorless matrix printers.

The fully optioned 132 column Prism Printer turns complex data into colorful, communicative information that you can

really use. Practical information that can help you develop ideas, make decisions and effectively communicate with others. Detailed inventory data, lengthy sales analyses and financial models can now be displayed more clearly and precisely than ever before with colorful text, charts and graphs.

And color is just part of the Prism Printer story.

Text quality print at up to 150 cps,

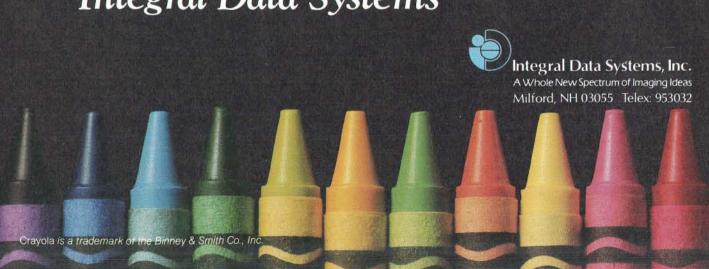
with proportional spacing and automatic text justification make the Prism Printer ideal for all your correspon-

dence requirements.
A new cut sheet feeder automatically positions an 8½" x 11" sheet for quick, hassle-free loading, while a software selectable Sprint Mode lets you fly through data at over 200 cps. And if your requirement is for

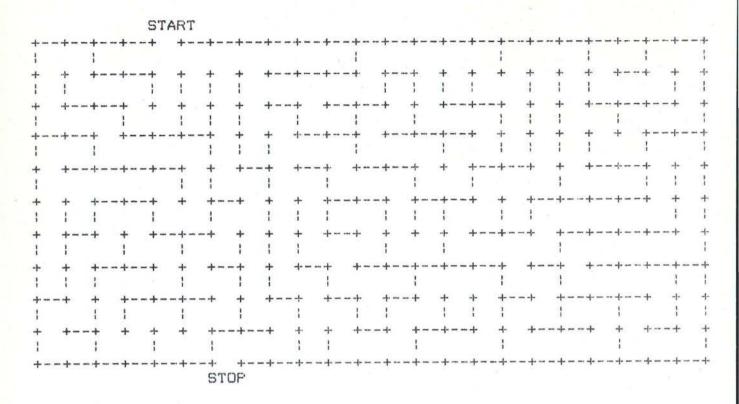
only an 80 column printer, or if you simply don't need some of the performance features mentioned, other configurations of the Prism Printer are available for even less.

How much less? Contact your local dealer to find out. Call toll free (800) 258-1386 (New Hampshire, Alaska and Hawaii, call (603) 673-9100) for your dealer's name. He'll color your output affordable . . . at just \$1995. And less.

# Affordable color. Now. Meet the ▲ Prism Printer™ from Integral Data Systems



Listing 2a: A 10 by 23 maze. This one is rather simplistic and illustrates how the maze is easier to solve from bottom to top.



**Listing 2b:** The contents of matrix M, the internal representation of the maze in listing 2a. Note the outer border of all 1s. This keeps the algorithm from skipping beyond the matrix boundaries.

1.	1	1	1	1.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1.	1	2	3	3	1	1	1.	1	3	3	4	1	3	1	1	2	1	1	2	1	4	1	2	1
1	2	3	3	2	2	2	2	1	3	1	3	4	2	2	4	3	2	2	2	3	3	4	2	1
1	3	3	2	3	4	4	2	1	2	3	4	1	4	З	3	2	2	2	1	2	1	3	4	1
1.	1	4	3	3	3	2	2	et.	1	3	2	3	3	2	1.	4	4	2	2	3	4	1	2	1
1	1	1	3	3	2	2	3	2	1	2	3	3	2	3	4	1	1	4	3	3	4	2	2	1
1	2	4	1	2	3	4	1	2	2	2	3	2	2	2	1	4	4	1	3	3	3	4	2	1
1	2	1	4	3	2	1	4	2	2	3	1	4	3	4	3	3	1	4	1	3	3	3	4	1
1	4	2	1	3	4	3	2	2	3	2	3	1	4	1	1.	2	3	2	3	3	3	2	2	1
1	1	4	2	1	2	1	4	3	2	1	2	4	1.	4	4	2	1	4	3	2	1	4	2	1
1	3	4	3	4	3	4	1	3	4	4	3	3	4	3	3	4	3	3	3	4	3	3	4	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

# Why wait?

## Announcing the mbp COBOL Compiler for CP/M-86\*...



available now.



Recently, 16-bit microcomputers have been the big news. And here's more news just as big: the mbp COBOL Compiler for 16-bit systems. Not a 'sometime-in-the-future' product, it's here now—we're already delivering.

For commercial and administrative applications, COBOL has long been recognized as <a href="the-lenguage">the-lenguage</a>. It's standardized and maintained like no other language—witness its popularity on mainframes for the last twenty years. Now, as 16-bit micros grow in popularity, so will COBOL. How can it miss? For business micro users, it opens up a whole range of benefits that previously only mainframe and mini users enjoyed. For application software developers, it's a completely new market—for dealers, too.

The mbp COBOL Compiler's fine features include: meets ANSI 74 Standard (low intermediate), certification applied for • real executable machine code—run-time efficient, memory efficient • use-proven reliability • user-friendly (example: over 500 error messages) • maximum portability protects software investments.

And it's available <u>now</u> for CP/M-86, iRMX-86\*, and ISIS\*; available soon for OASIS-16\* and MS-DOS\*.

Who is mbp? We're a worldwide company with more than twenty-five years of system software experience—more than twelve in custom COBOL Compiler installations for mainframes and minis. Now, this vast experience is also available to micro users. Take advantage of it—send the coupon or call today and start getting mainframe capabilities from your CP/M-86 micro. Why wait?



7700 Edgewater Drive, Suite 626 B Oakland, California 94621 Phone 415/632-1555

mbp COBOL is what I've been waiting for. Please send me today:

Special introductory offer □ mbp COBOL for CP/M-86 at single copy special introductory price of \$990. (User's Manual included. Offer expires June 30, 1982 when retail price will become \$1400.) mbp COBOL User's Manual only, \$95. ☐ Complete mbp COBOL information. Please have a representative contact me with information about OEM and distributor arrangements. Name Company\_ Street (no PO Box numbers)\_ \_State \_\_\_\_Zip\_ ☐ VISA ☐ Check enclosed UPS C.O.D. ☐ Mastercharge

Card Number\_\_\_\_\_Exp. date\_\_\_\_\_

(Add \$3 for shipping. California residents add sales tax.)

Signature\_\_\_\_\_ Hardware required: 96K memory, hard disk, 8-inch floppy.

\*CP/M-86 is a Digital Research trademark; iRMX-86 and ISIS are Intel TMs; OASIS-16 is a Phase One Systems, Inc. TM; MS-DOS is a Microsoft, Inc. TM.

See us at COMDEX Booth 1467

mbp COBOL. Now.

Q is a Boolean variable that is also used as an arithmetic argument. The value of Q decides whether we advance to the next cell of a line (Q = 1) or not (Q = 0).

The program is very simple. Since it requires only integer arithmetic and uses a maximum integer value of 15, it is a rather trivial task to convert to machine language. Since each maze cell can attain only five values, this means that on a 60K-byte computer, assuming 4K bytes are used for program and operating system, and

assuming each byte is broken into two cells, a maze

 $\sqrt{(60000 \times 2)}$  or 340

cells square is possible. Since a 132-column printer can print only 43 cells across, this means a 2500 by 43 maze can be created. Assuming 66 lines per page, a maze almost 80 pages long is possible.

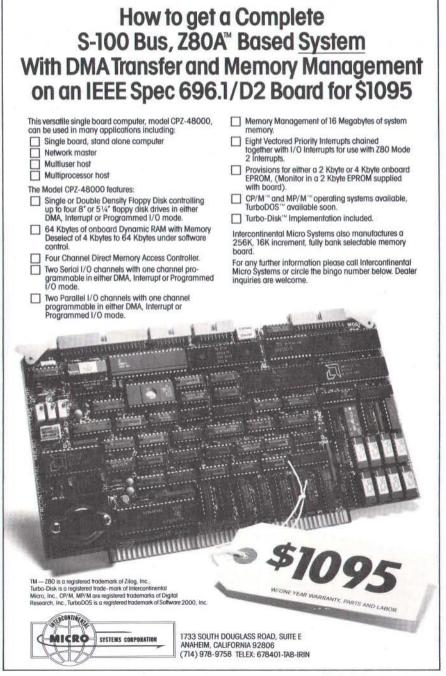
The algorithm is fast. There is almost no delay between successive lines of the maze on my line printer past the first few (I use a Horizon computer at 4 MHz with an Anadex printer).

## Possible Enhancements

One side effect of the algorithm is that the maze is almost always easier to solve by traveling from bottom to top. This makes sense when you realize that there are more possible pathways for the maze maker when the maze is "voung" than when it is "older" (farther down, or more complete). Pathways created will generally be longer near the top of the maze and will have more possible paths diverging from them. A nifty solution to this problem is to duplicate the same algorithm in reverse, starting from the bottom right cell and moving from right to left, bottom to top. However, if the program figures out one line at the top, then one line at the bottom, alternating, the maze will be impossible to solve since the two separate pathways will never intersect. To fix this problem, randomly pick one place where the two pathways run side by side and cut a wall to connect them at that point, Naturally the correct solution of the maze will run through that hole.

Another option to make the mazes more difficult is to weigh the random-number generator in favor of paths that extend vertically—at least for the first several thousand decisions (this is assuming the maze is higher than it is wide, which will normally be the case). Other "derandomizing" operations on the random-number generator output can create beautiful and eye-catching patterns, not to mention some eye-strainers.

After each line of the maze is printed, the corresponding matrix row is never used again. It is possible at that time to shift the entire matrix up one row. The first line disappears, the second becomes the first, the third line becomes the second, and so on through the end of the matrix. Be careful to set the last line to frontier status. The program then becomes capable of making *infinite* length mazes having only a single solution. Implementation of this feature is left to the motivated reader.



**Yes.** 

I want to turn my microcomputer into a powerful information and communications system. Send me your free Information Kit.

For free Information Kit

call toll free 1-800-323-1718.

16-page color brochure. Complete listing of 1200 programs.

□ No.

Thanks anyway, I'm already on-line with THE SOURCE.SM

If you are not one of the more than 11,000 microcomputer, data terminal or communicating word processor owners who already subscribe to The Source, send in this coupon

or call us toll-free. We will send you our free Information Kit that describes the over 1200 programs and services now available from The Source. You'll see how easy it is to turn your microcomputer into a powerful information and communications system.

With The Source, you get hundreds of useful services for the home or for helping you run

your business more profitably. You can get current stock prices, make airline reservations, find a good restaurant, barter goods and services, get up-to-the-minute sports and news from UPI. You can communicate instantly through electronic mail with branch offices and field representatives subscribing to The Source; you can create your own business programs, on either a simple or sophisticated level.

In addition to all this, you also have access to hundreds of easy-to-use data bases, electronic games, informative and educational programs (including lessons in geometry and spelling, foreign language drills and math reviews), and a unique shop-at-home service that lets you buy over 30,000 brand name

items at discount prices.

You can do all of this easily and inexpensively with a local phone call in more than 350 cities across the country, and at a one-time subscription fee of only \$100.00 and usage costs as low as \$4.25/hour.

If you'd like to get the most out of your personal computer or data terminal, call our toll-free number or send for your free kit today.

You have nothing to lose and a world of information to gain.

Mail to:

Source Telecomputing Corporation, Dept. (22M) 1616 Anderson Road, McLean, VA. 22102.

Name		
Company		
Address		
City	State	Zip
Telephone ( )_		
Type of Equipment		



The Source is a servicemark of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc.

## **Hardware Review**

## Colne Robotics Armdroid

## The Small-Systems Robot

Steven W. Leininger 5402 Summit Ridge Trail Arlington, TX 76017

If you think you've explored all the possible hardware options for your small-computer system and are looking for some excitement, you might be interested in Armdroid, a new computer-controlled robot arm. The bright orange mechanical arm is available from Colne Robotics in kit or assembled form, complete with power supply and interface electronics. The kit form, besides being less expensive, "enables the person assembling the device to understand the principles of the robot," according to the manufacturer. The robot can be used for a variety of experimental and educational applications. It has 6 degrees of motion and a lift capacity of 10 ounces. I received both a kit and an assembled Armdroid for my evaluation, along with a "preliminary" manual.

## Mechanical Description

The Armdroid has five major mechanical components: the base, the shoulder, the upper arm, the forearm, and the wrist and hand assembly. Each section is connected to its neighbor by a pivoting or rotating joint. The stationary base sits on the tabletop and provides support for the rest of the arm. The base, which also serves as the enclosure for the stepper-motor-drive electronics, contains the motor which rotates the arm about a vertical axis through the base.

## About the Author

Steven W. Leininger was the design engineer for the original Radio Shack TRS-80 Model I microcomputer. He is now an independent computer consultant.

## At a Glance

## Name

Armdroid

## Use

Robotic arm

## Manufacturer

Colne Robotics 207 NE 33rd St.

Fort Lauderdale, FL 33334

## Dimensions

At shoulder: 18 by 18 by 29 cm (7 by 7 by 11.5 in)

Shoulder pivot height: 25 cm (10 in)

Arm length at maximum extension from shoulder pivot to finger tip: 48 cm (19 in)

## Price

Kit: \$595

Assembled: \$695

## Features

6 degrees of motion; menu-driven control software; 10-ounce load capacity

## Additional Hardware Needed

TRS-80 Model I Level II (other microcomputers will be supported in the future)

## Additional Software Needed

Learn, an interactive menu-driven control program (included)

## Hardware Option

Zero-position sense switches

## Documentation

Construction and Operation Manual, 87 pages

## Audlence

Experimenters, students, and professionals interested in robotics

# GA



## 5-10-20 Megabytes in an add-on hard disk for:

IBM Personal Computer • Xerox 820
Apple • SuperBrain • Heath-Zenith
TRS-80 Models II & III

Targa, a truly high performance design, whether by Porsche or by CMC. Targa hard disk system, a significant extension to the storage capacity of your microcomputer, at an unheard of price/performance ratio. Suggested list for 5 mb:

only \$2895.

Targa 5 6.38 Mbytes unformatted, 5 MB formatted. Upgradeable to 10 MB

Targa 10
12.8 Mbytes unformatted, 10 MB formatted. Upgradeable to 20 MB formatted

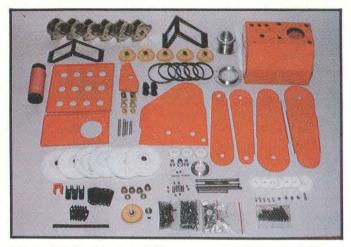
Targa 20 20 Mbytes formatted, 25.6 MB unformatted Our Targa Winchester-type, hard disk drives are offered in desk-top dimensions of 15" × 51/4" × 131/2". It comes complete with cables, software and interface. Call or write for complete specifications and/or the dealer nearest you. Dealer inquiries invited.

Circle 77 on inquiry card.

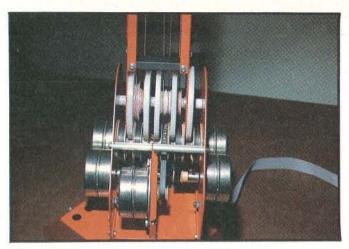
# **CMC INTERNATIONAL**

A Division of Computer Marketing Corporation

11058 Main • Suite 220 • Bellevue, WA 98004 • Phone (206) 453-9777 • Telex: 152556 SEATAC



**Photo 1:** The Armdroid kit's many parts. The cost of the six stepper motors (at the top of the photo) is offset by the relatively inexpensive stamped-steel chassis and structural parts. The power supply and interface electronics are not shown.



**Photo 2:** The shoulder contains five of the six stepper motors. Reduction gears are used to increase the force applied via the drive cables.

The shoulder rotates on the main bearing, a fairly heavy-duty ball-bearing assembly at the top of the base. Five stepper motors and associated reduction gears and drive belts are mounted on the shoulder and provide motion control to the arm, wrist, and hand.

The upper arm connects to the shoulder with a horizontal pivot and is rotated on that pivot by one of the stepper motors in the shoulder. If you move the upper arm vertically, the hand is raised and brought closer to the base. Cable-driving gears transmit motion to the forearm and the hand and wrist assembly; these are mounted in the shoulder end of the upper arm.

The forearm fastens to the upper arm with a horizontal pivot and is rotated about that point with one of the motors in the shoulder. The primary response to pivoting the forearm is the raising or lowering of the hand with respect to the tabletop.

The hand and wrist assembly attaches to the end of the forearm with a combination horizontal pivot and bevel gear assembly. The operator uses two motors in the shoulder to either rotate the hand about the pivot (an upand-down motion) or twist the hand about its axis. The remaining motor in the shoulder opens and closes the hand's three rubber-tipped metal fingers.

You can move any section independently without affecting the orientation of the other sections because of the Armdroid's parallelogram-type construction. This independence of control permits the angle of the hand to remain constant with respect to the workbench while the rest of the arm is manipulated to position the hand in the desired location.

#### Interface Electronics

The Armdroid I tested came with an I/O (input/out-put) adapter for the Radio Shack TRS-80 Model I. This adapter, a nonlatched parallel port, plugs into the expan-

sion port on the TRS-80. A cable from the adapter plugs into the base of the Armdroid.

Colne Robotics has mounted two printed-circuit cards within the base of the Armdroid: the interface board and the motor-drive board. The interface board accepts signals from the TRS-80, conditions them, and converts them to pulses of the duration and shape suitable for controlling the arm's motors. The motor-drive board amplifies the signals to provide the voltage and current levels required to drive the motors' coils.

You can set the Armdroid's internal electronics for external computer control or operation via manual switches by making the selection on the two printed-circuit boards inside the Armdroid's base.

#### Building the Kit

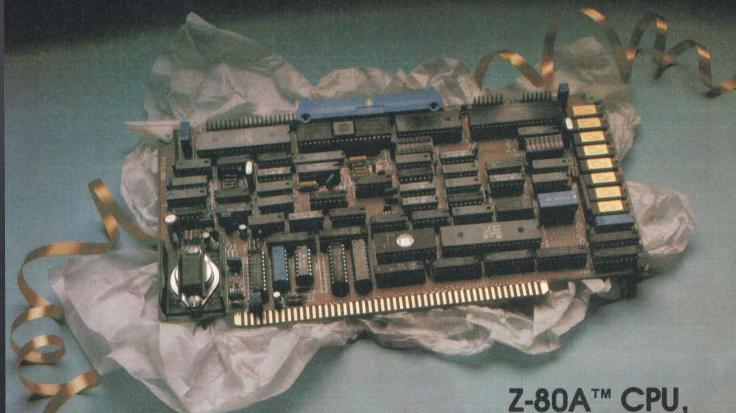
Being a disciple of Erector Set and Heathkit, I had no fears about venturing out into the frontiers of robot kit building. To get a feel for the scope of the project, I laid all the parts out and familiarized myself with the construction section of the manual.

The manual I received was a preliminary version. The entire mechanical assembly instructions were on just six pages! Undaunted, I forged ahead. About halfway through the first paragraph, I was instructed to glue magnets onto some of the gears. Apparently, the magnets are optional (at least they weren't included in the kit), but no mention was made of that fact. The system uses the magnets and their respective reed switches to sense the home position of the gears.

The instructions rambled on, sometimes with several steps in a sentence. The manual specified part numbers (usually) but didn't refer to the drawing numbers.

I knew the next part was going to be tricky because the instructions said that an assistant would be helpful. The task at hand was to assemble a dual-race ball-bearing assembly from scratch. Using refrigerated petroleum jelly

# A Good-Buy Present.



Floppy Disk Controller, 64K of Memory, Serial & Parallel I/O Ports...all on a SINGLE S-100 BOARD!

Your business computer market has problems-expensive, powerhungry machines that are hard to expand and even harder to service. Advanced Micro Digital Corporation has the solution-SUPER/quad, a TRULY single S-100 board computer that will seem like a dream to skeptical technicians and salesmen-not to mention your customers. SUPER/quad is less expensive, less difficult to service and expand and requires less power than traditional four board S-100 systems; yet it contains all their popular features:

- IEEE S-100 Standard
- · Z-80ATMCPU
- 64K Bank Select Memory
- Both 8" or 51/4" Floppy Disk Controller (WD 1793 chip)
- 2 Serial & 2 Parallel I/O Ports
- · Real Time Clock Interrupts
- 2K Monitor EPROM
- · Extended Addressing
- Runs with CP/M<sup>TM</sup>, MP/M<sup>TM</sup> and CP/NET<sup>TM</sup> and Turbodos<sup>TM</sup>
- · One Year Warranty

Advanced Micro Digital
Corporation is dedicated to the research and development of
S-100 computer technology. The maintenance of superb quality in our product line is our priority.

Now you can say "Good-Bye!" to all your old S-100 boards without giving up convenience and configurability, because now its all on a single S-100 computer board.



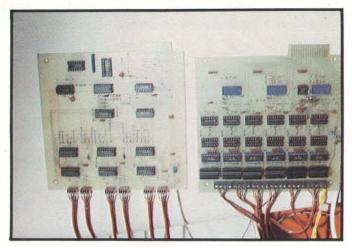
For more information on SUPER/quad write or call:

7201 Garden Grove Blvd. • Sulte E • Garden Grove CA 92641 • (714) 891-4004 • TELEX: 678401 tab Irin

\*\* Registered Trademark of Digital Research Corp.

Circle 9 on inquiry card.

Copyright 1981 Advanced Micro Digital Co



**Photo 3:** The controlling circuitry is contained on two printed-circuit boards. The motor-drive board (left) and the microprocessor interface board (right) are easy to assemble and connect directly to a TRS-80 Model I (versions for the Commodore PET, the Apple II, and the Sinclair ZX81 are planned).

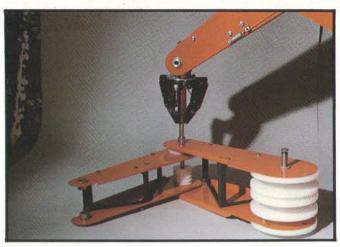


Photo 4: A mechanical assistant can speed the assembly of the

as per the instructions, I greased the bearing track and imbedded 24 ball bearings in the goo. After carefully inserting the base-support column into the bearing and turning the assembly upright, I attempted to repeat the job on the upper bearing track.

Darn. While tightening the adjusting ring, three balls hopped out of the lower bearing and huddled in a mound of petroleum jelly. Back to the beginning; twice more the same thing happened. Arrgh!! Finally, success! But wait, why was the shoulder pan rubbing on the shoulder-drive gear? And, wasn't that ball-bearing assembly just a little bit off parallel? At this point, I decided to cheat and look at the factory-assembled Armdroid. It appeared that the bearing-support column was too short. I described my problem to the gentlemen at Colne Robotics over the phone and was told that I probably had the bearing ring—an almost but not quite symmetrical part—on upside down.

I tried it again: I disassembled the bearing, inverted the bearing ring, and carefully placed the steel balls in the petroleum-jelly-coated track (I'm pretty good at this by now). Continuing as before, I installed the adjusting ring and beheld a smoothly operating shoulder bearing.

The instructions continued: put this motor here, put these gears there, and see the drawing. Well, I looked at the drawing. (The drawings are good up to a point, but they lack fine detail or close-ups in some areas.) I cheated a couple more times by looking at the assembled arm to verify my understanding of the drawings and text.

Assembly continued on the upper arm and forearm. The wrist posed no major problems. Then disaster struck! The fingers are held together with a large number of "circlips" (split rings that fit around the outside of a shaft). The circlips allow you to slide a rod through a hole, then prevent the rod from sliding back again. A special pair of circlip pliers is an absolute necessity to proceed beyond this point. I tried to make do with what I

had (needle-nose pliers, screwdrivers, etc.) and realized I definitely needed the proper tools. It would have been nice if the appropriate pliers came in the kit or were at least available as an option.

The final assembly of the hand progressed easily after I purchased the circlip pliers. The instructions said to connect the arm assembly to the shoulder and base assembly. The cable threading came next. In the helpful hints section, the instructions said that this operation is greatly simplified by threading the arm before attaching it to the shoulder. So I started over again.

The actual cable threading progressed well, except for a clearance problem on one of the wrist cables. After checking the preassembled arm, I decided that cable clearance in the wrist is an assembly problem that Colne Robotics had experienced and corrected but had not updated in the manual. Ten minutes later, the offending cable had been restrung and worked smoothly.

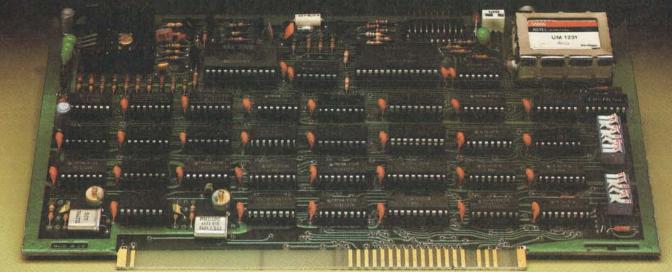
The two printed-circuit boards went together just about as well as one would expect. No part numbers or reference designators were silk-screened on the boards, so I had to rely on the drawings in the manual for parts placement. Mounting the interface and motor-driver printed-circuit boards into the base of the Armdroid and connecting the stepper-motor wires to the driver board completed the assembly operation.

#### Using the Armdroid

A machine-language cassette for the TRS-80 Model I Level II microcomputer comes with the Armdroid. The menu-driven program, named Learn, allows you to familiarize yourself with the operation of the robot arm and to create, modify, and save motion sequences.

The manual suggests reading through the software description quickly and proceeding to the "Introductory Demonstration Sequence" section, which tells you to load Learn and enter the learn mode by typing an "L".

# **Introducing the METROTECH Viewdata Option**



# METROTEL

All you need to extend your \$100 Business Computer to bring you the last word in Viewdata Systems, plus the internationally acclaimed Prestel.<sup>(17)</sup>

METROTEL – in one flexible package it offers all you need for creating, running and editing the most advanced of inhouse viewdata systems – with all the advantages of linking up with the Prestel world-wide videotex service.

METROTEL – a new type of information service for general business use.

Simple to use, METROTEL brings to the S100 computer a complete viewdata system. Timely information can be displayed in full colour on many remote monitors, and with METROTEL's sophisticated editing facilities, eyecatching screens can be rapidly created.

Ideal for setting up private systems for use in hotels, conference centres, shopping centres or any public area – or anywhere you require 'in your home' or 'in your office' notice board facilities.



## VIDEOTEX NOW The Prestel World Service

METROTEL places the world at your fingertips via the PRESTEL World Service. Through PRESTEL, world-wide videotex information banks are now available in the United States at the touch of a button – including –

WORLD-WIDE COMMODITIES' PRICES,
INTERNATIONAL MESSAGING, BUSINESS NEWS,
WORLD NEWS, TELESHOPPING, TRAVEL AND
RESERVATIONS, INTERNATIONAL NEWSLETTERS, ETC.
METROTEL was designed and
implemented in England, the birthplace of
PRESTEL, and is fully compatible with the
PRESTEL system. The PRESTEL World
Service offers a low monthly charge and
pay-as-you-use billing, and, with
METROTEL you can have it on your
computer... NOW.

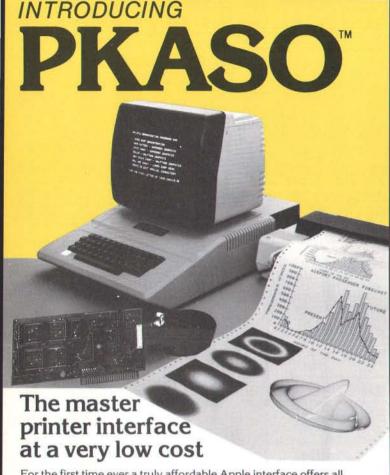
For further information on PRESTEL, contact: Logica 212/599-0828, 666, Third Avenue, New York, NY 10017

To obtain your METROTEL system, 'phone METROTECH in England on Uxbridge (City Code 895) 57780 or telex us on 935302. Better (and cheaper) still, find your nearest METROTEL owner and send us an immediate message via PRESTEL Number 01937 9861.

Circle 118 on inquiry card.



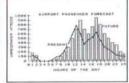
WATERLOO ROAD · UXBRIDGE · MIDDLESEX UB8 2YW · ENGLAND · Tel: 0895 57780 Telex: 935302



For the first time ever a truly affordable Apple interface offers all the most sophisticated text and graphics capabilities on Epson®, Okidata®, Centronics®, and IDS® printers. With the easy to use PKASO Interface, you simply slip it into your Apple Computer,® attach the cable to your printer, and enjoy all these features:

Broadest range of text printing using your software • HiRes graphics with up to 40 creative options • LoRes and HalfTone graphics in 16 levels of gray • SuperRes plotting with up to 2160 x 960 points per page • User created or software defined characters and symbols • Full text and graphics dump of absolutely any screen image.







Gray scale printing

Snapshot screen dump

imp Apple /// compatibility

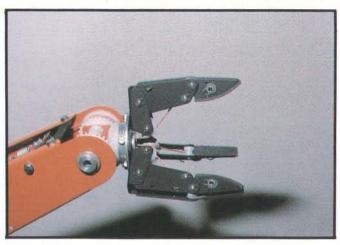
At Interactive Structures we've built our reputation on innovation, quality and service, and we're doing it again with the new PKASO series. The PKASO Interface will bring out the best in your Apple Computer, your data printer and your program. It will perform with all popular languages such as BASIC and ASSEMBLER. It will print both text and graphics with PASCAL. And it's the first and only Apple interface to offer all this <u>plus</u> support for the Apple Z-80 CP/M System and for full Apple III operation.

Don't settle for less. And don't pay more. Call us now for the name of the PKASO dealer near you. Circle 210 on inquiry card.



Interactive Structures, Inc. 112 Bala Avenue P.O. Box 404 Bala Cynwyd, PA 19004 (215) 667-1713

Apple Computer is a registered trade name of Apple Computer Inc., Epson is a registered trade name of Epson America Inc. Okidata registered trade name of Okidata Corporation. Centronics is a registered trade name of Centronics Data Computer Corporation. IDS is a registered trade in ame of Integral Data Systems. Inc.



**Photo 5:** The hand and wrist assembly has three fingers. The fingers are opened and closed in unison under program control. The wrist allows both rotation and up-and-down motion of the hand

This mode lets you manually operate the robot while programming it to follow the same motions automatically.

The program asks you if you want to start again, continue from the present position, or exit the program. Type "S" to clear the memory and free the arm. The arm is free when no torque is applied to the stepper motors. This allows you to initialize the Armdroid's position by hand using the large gears in the shoulder. When you are satisfied with the starting position, press the space bar. The program applies torque to the arm, effectively stiffening and locking the arm in place.

You can now move the arm using the Q, W, E, R, T, Y, and 1 through 6 keys to manually control the movement of the different parts of the arm. If you're like me, it will take a couple of tries to predictably move the arm, rotate the wrist, and open and close the hand under manual control. Type a "0" to get out of the learn mode.

Now the miracle of life! Press "G" for go, and the Armdroid takes the shortest path to your initial starting position. The program then asks "O" (once) or "F" (forever). Forever seems like a long time for something you haven't tried yet, so type "O".

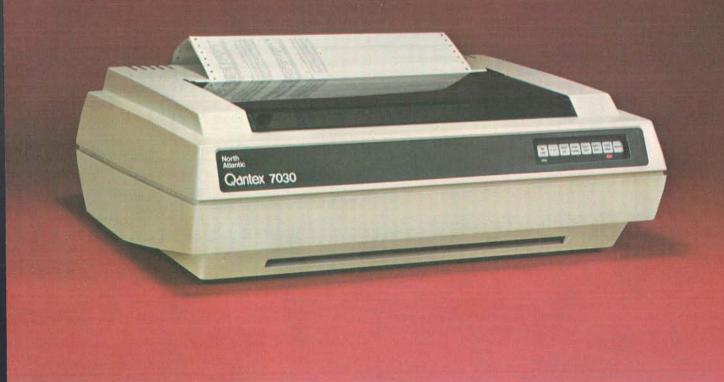
Wow! The arm is doing just what you taught it to do! And without the long pauses for head scratching and note taking! You are returned to the menu.

To look at the sequence of commands that were sent to the stepper motors, type "D" for display. A table appears on the screen showing the stepper increment values stored in memory.

To extend the sequence of movements, simply reenter the learn mode, and type "C" for continue. You can add additional motions by using the manual-control keys. Once again, you must type "0" to return to the menu mode.

After testing the new sequence, you may decide that some of the motions need to be fine tuned. This can be done using the edit mode.

# The MultiMode Printer with The Magnificent Fonts



#### MultiMode Printer Offers Flexibility

#### The "Beautiful" Font



### . . . At a Sensible Price—\$1,995 (Qty. 1)

"Flexibility" means instantaneous call up of any of this trendsetting machine's many features whether for word processing, data processing, graphics or forms generation. Using either of the two built in interfaces, an external keyboard or downloading from your computer, you can program the Qantex Model 7030 to do more.

Compare the "Beauty" of our printed letters for the word processing fonts which include Cubic, Trend, Spokesman, Courier, Italics, Script, OCR-A, APL, Scientific plus downloaded fonts from your computer. Draft copy modes include 8 resident fonts — U.S., U.K., German, French, Spanish, Swedish, Finnish, Norwegian and Danish.

Other features include high resolution graphics — 144 x 144, single pass and double pass word processing, and 180 cps data processing modes and user defined formats.

Operator initiated, the MultiMode printer provides a complete printed status report of operating parameters and diagnostics.

For more information, or a demo, call us about the new Qantex Model 7030 MultiMode Printer.

Qantex Division of North Atlantic 60 Plant Avenue, Hauppauge, NY 11788 (5.16) 582–6060 - (800) 645–5292

\*Registered Trademark of North Atlantic Industries

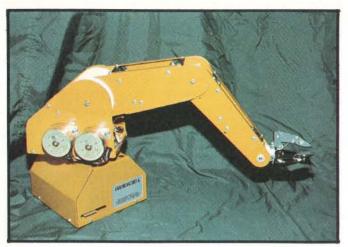


Photo 6: The Armdroid has a maximum reach of 19 inches from the shoulder base.

Three cassette-tape commands allow you to save your Armdroid sequence for a rainy day. "W" (write) saves the sequence in memory on the tape, "R" (read) retrieves the sequence from tape, and "C" (check) verifies that the data on the tape is the same as that in memory.

Colne Robotics has graciously included the source listing for the Armdroid control software in the manual. The Z80 assembly-language source is well documented and should prove to be a valuable learning tool for the student of robot technology. The source code is also useful to those who wish to modify the control software for a specific application.

I understand that Colne Robotics is developing similar software for other microcomputers, such as the Commodore PET, the Apple II, and the Sinclair ZX81. Watch their advertisements for further details.

#### Documentation

The 87-page manual is broken down into four sections. The introduction section is nine pages long and strays from the purpose of an experimental robot arm. Discussions on the economic and social impact of industrial robots, complete with tables and formulas, seem more like padding than useful information.

The second section deals with the mechanical assembly of the Armdroid. As noted above, some deficiencies and inaccuracies in the instructions exist. A hand-holding, step-by-step approach would benefit the novice builder.

The next section details the electronics of the Armdroid. This section was not too bad, but again a step-bystep approach would be helpful.

The final section describes the software package included with the arm. This chapter of the manual was the easiest to use, due in part to the quality of the Learn program itself. And I applaud the inclusion of the program listing as an aid to understanding the ins and outs of microprocessor-controlled robotics.

It should be noted that my review is based on a "preliminary" manual for the Armdroid. I have been reassured that the manual will be revised to eliminate some of the limitations that I have noted above.

#### Conclusions

- The Armdroid is a low-cost manipulator with good dexterity and maneuverability.
- The software delivered with the arm is easy to use and serves as a powerful tool in understanding robot operation.
- The Armdroid kit is not for the inexperienced builder, unless the manual is improved.
- •I feel I have learned a lot about the mechanics, electronics, and software of robots, thanks to the people at Colne Robotics.

by Harold Ableson

The name Logo describes not only the evolving family of computer languages detailed in this book, but also a philosophy of education that makes full and innovative use of the teaching potential of modern computers. Apple Logo presents the Apple II user with a complete guide to the applications of this unique system and also includes a description of TI Logo for users of the Texas Instruments 99/4 computer.

The designers' vision of an unlimited educational tool becomes a reality for the Apple II user who begins to work with this procedural language. Logo enables even young children to control the computer in self-directed ways (rather than merely responding to it), yet it also offers sophisticated users a general programming system of considerable power.

Apple Logo actually teaches programming techniques through "Turtle Geometry"-fascinating exercises involving both Logo programming and geometric concepts. Later chapters illustrate more advanced projects such as an "INSTANT" program for preschool children and the famous "DOCTOR" program with its simulated "psychotherapist."



ISBN 0-07-00425-0 240 Pages Softcover, spiral-bound \$14.95

Call Toll-Free 800/258-5420

BYTE Books 70 Main Street Peterborough, N.H. 03458



Right for the time. Finally someone invented an RS-232C compatible calendar/clock system, complete with 6-digit display... and selling for only \$249. Hayes did it!

Introducing the Hayes Stack Chronograph, the newest addition to the Hayes Stack microcomputer component series. It allows your computer to accurately record all of your system activities by date and time...down to the second. Thanks to a battery back-up system, you never have to reset the time when your computer is off, and it will keep on ticking even when there's a power failure. A write-protect switch prevents accidental



Microcomputer Component Systems

changing of day, date or time.

Right for the job. The Hayes Stack Chronograph is ideal for any home or business application requiring accurate timekeeping. Use it for timing everything from lights, burglar alarms, or sprinkler systems ... to sending mail electronically (with the Hayes Stack auto-dial Smartmodem and your computer) ... logging and recording reports or time-sharing access time ...

and batching all your messages to send at night, when rates are lowest. Chronograph helps do it all.

And Chronograph stacks up. Keep your computer system up-to-date with the Hayes stackables, including the RS-232C compatible Smartmodem, the most sophisticated 300-baud originate/answer modem you can buy. And yet, it's probably the easiest to use too.

The Hayes Stack Chronograph and Smartmodem are available wherever fine computer products are sold. It's time. And it's now.

The Hayes Stack Chronograph and Smartmodem are available wherever fine computer products are sold. It's time. And it's now.

The Hayes Stack Chronograph.
There's no better time.



### **Software Review**

# Super FORTH Isn't

Gregg Williams Senior Editor

Let's imagine that someone has just implemented a language that looks something like BASIC, but that it has some very strange and arbitrary qualities. For example, not every line has to have a number, but all line numbers must end with a 5. All variables must be exactly three characters long. The BASIC keyword STEP is replaced by the word EVERY, and variables used in an INPUT statement must begin with the letter I. Although the language works-you can write programs in it-how would you feel if the manufacturer called the product Super BASIC?

It's apparent that I'm very disappointed with Hayden's Super FORTH and that I don't believe it is a worthwhile product. When I first saw the ads, I was very excited about the product. It ran on the Apple (only one very expensive Apple FORTH existed at the time); it implemented Apple high-resolution graphics, floating-point numbers, and string variables (none of which are usually supplied in a standard FORTH); and the \$49.95 price was right. At the time, I thought Super FORTH might become the de facto standard for the Apple II.

#### At a Glance

Name

Super FORTH

Version of the FORTH programming language

Manufacturer

Hayden Book Company Inc. 50 Essex St. Rochelle Park, NJ 07662 (201) 843-0550

\$49.95

Author

Larry Bugbee

Format 51/4-inch floppy disk (boots under DOS 3.2 or BASIC's

Language Used

6502 threaded machine code

Computer Needed

Apple II with 48K bytes of memory and Applesoft either in ROM or loaded into the Apple Language Card

Documentation

35 pages in a 3-ring binder

Audlence

People interested in FORTH

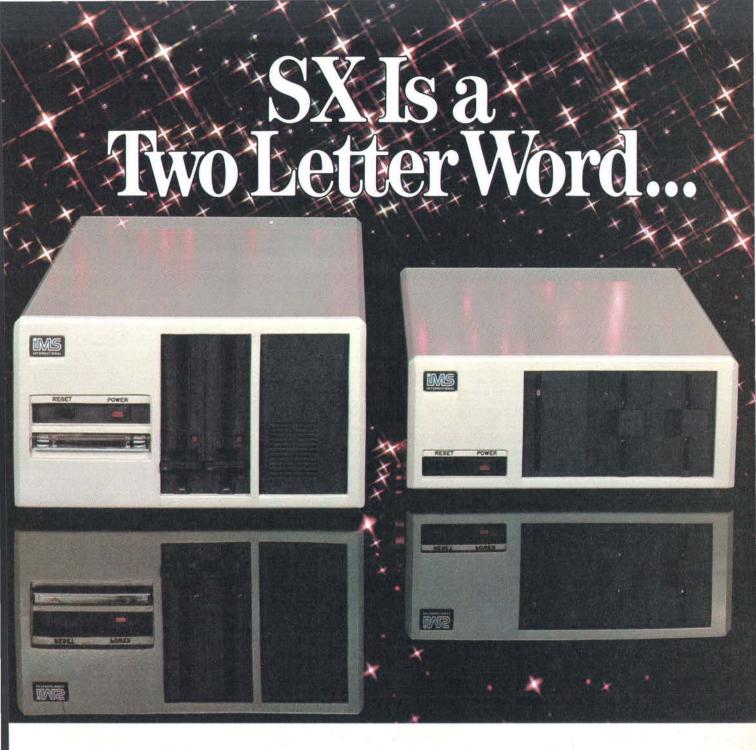
I have been working with different versions of FORTH for about a year and a half and have used versions based both on and independent of the FORTH Interest Group (fig) version. I say this to indicate that I can be fair with a non-fig-FORTH implementation. I spent several nights programming on the Super FORTH system, and my conclusion is this: if you want to use this particular version of FORTH because of the features mentioned above, fine. However, if you're interested in interacting with the world of FORTH outside the confines of the Super FORTH instruction manual, you should buy a different version.

#### Problems

To indicate why I formed my opinion of this software, here are some of the problems I found.

Super FORTH lacks the "screen" mechanism almost universally used to store FORTH source code for later compilation. It has only two commands that let you store either the entire contents of the FORTH system at that time or only newly defined words. This means that if you want to modify a definition, you have to FORGET it (oops-Super FORTH has no word for FORGET) and retype it. If the word you're redefining isn't the most recent one defined, you automatically lose every word defined after that word, and you have to retype those words as well. The absence of this feature alone puts an unreasonable burden on the Super FORTH user.

Certain essential FORTH words are missing; others have arbitrary nonstandard definitions. For example, the words ROT (which rotates the top three numbers on the stack), { +! } (which adds a number to a variable), and FORGET are missing in Super FORTH. (The braces are standard BYTE notation for FORTH words that include punctuation and for lists of FORTH words.) In addition, other words behave differently. The word C@ in other FORTHs takes the contents of a single byte and puts the byte on top of the FORTH stack; in Super FORTH, the corresponding word 1@ must be followed (don't ask me why) by the words { OPUSH SWITCH } to make the number available on the top of the stack.



...describing the price performance leaders in table top computers.

Owning an SX from IMS International is a joy no matter which model you choose.

Both give you Winchester performance and a lot more.

Our 5000 SX table top computer features either a 5.5 or 11 MByte Winchester subsystem, plus one or two 51/4" floppy drives.

And our 8000 SX offers a 10, 20 or 40 megabyte Winchester, plus one or two 8" floppies, and a 17 megabyte incremental cartridge tape drive subsystem.

Both high performance Winchester subsystems deliver awesome speed — ten times faster than floppies, on the average. You can load a 20 KByte system program in less than a second.

More importantly, IMS systems are engineered for reliability, so downtime won't take away the gains Winchester technology brings. They're strictly business, from their metal-not-plastic cabinets to their test-don't-guess circuitry.

And with our full 2-year warranty, you have it in writing.

Software for the SXs includes either single user, or our new high performance multiuser/multiprocessor operating systems, plus BASIC, FORTRAN and COBOL languages, and a host of compatibility-tested application programs.

For complete information and specifications on the 5000 SX and 8000 SX, along with the location of your nearby IMS International dealer, just contact us. We'll tell you everything you ever wanted to know about SX. Call (714) 978-6966 or (702) 883-7611 today, or write:



WE BUILD COMPUTERS AS IF YOUR BUSINESS DEPENDED ON THEM.

2800 Lockheed Way, Carson City, NV 89701 • Telex: 910-395-6051

Circle 200 on inquiry card.

Another arbitrary difference is that do-loops in Super FORTH cannot be nested in the same word (contrary to the way all other versions I know of work). In Super FORTH, you must define a word that contains the inner do-loop, then use this word within the do-loop of another word. Again, this is a problem only if you plan to interact with the rest of the FORTH world. Unfortunately, Super FORTH has too many such problems.

Although the Super FORTH system worked most of the time, it "went away" (irretrievably malfunctioned) many more times than my two other versions of FORTH. I counted four fatal malfunctions in one session.

Many FORTH functions, given the same name in every other FORTH implementation, are given other names in Super FORTH, For example, the FORTH words { C@ C! C, } are in Super FORTH { 1@ 1! 1, }. This small point is annoying when trying to relate Super FORTH to other written material about the FORTH language.

Another annoying point is that all numbers printed from the stack are always printed with leading zeros (e.g., 0005 if you are in hexadecimal mode, or 00005 if you are in decimal mode). Although this would be useful in printing tabular material, I think the fixed display width indicates a lack of craftsmanship.

#### Good Points

To be fair to Super FORTH and its author Larry Bugbee, the product does contain a number of things that are quite good.

The documentation for Super FORTH is better than average when compared to other FORTH products. Word definitions are grouped by function and are explained with a minimum of jargon. In a radical departure from most FORTH documentation, most word definitions include an example of their use, and some even give guidance for their proper use.

Super FORTH includes words that allow you to do Apple high-resolution graphics on high-resolution page 1. It allows you to draw boxes, blocks (filled-in boxes), points, lines, and shapes in any available high-resolution color. You can draw shapes, but the XDRAW function is not supported. You must have Applesoft in ROM or in a Language Card for these commands to work. (The bulk of Super FORTH will work without Applesoft.)

Another set of words implements a stack for floatingpoint numbers and operations. (The regular FORTH stack works on 16-bit signed integers only.) The list of floating-point words is guite long and comprehensive, making it probably the best feature of Super FORTH. These words also require Applesoft to work.

Super FORTH includes a set of words that allows you to manipulate character strings. The words do the following operations: creation of string variables, string constants, and a string stack; string concatenation; string assignment: and substring manipulation through a MID\$ word.

Finally, Super FORTH includes some words that allow you to directly manipulate the FORTH environment. Little guidance on how to do so is given, but this is usually the case with most FORTHs. These words are meant for use only by veteran FORTH programmers, and it is good they are there. For example, it should be possible to use them to make a call to the Applesoft ROM to implement the high-resolution XDRAW function.

#### Conclusions

The inability to store FORTH source code for later modification and recompilation is a major defect of Super FORTH.

On the other hand, the implementation of string, floating-point, and high-resolution graphics words is a definite advantage for someone who wants to use FORTH with these capabilities. They can be added to other FORTHs, but this would be a lot of work in itself.

Unfortunately, I cannot recommend Super FORTH to people interested in learning FORTH. The many differences between it and the two leading versions of FORTH (those supported by FORTH Inc. and the FORTH Interest Group) would make it difficult for the user to learn from the existing body of information on FORTH. It could be done, but it would require a lot of extra work.

The HOMEBRAIN™ is a dedicated microcomputer system in a stand-alone package. HOME-BRAIN'STM I/O potential exceeds 300 channels.

#### **ACHIEVE TOTAL** HOME CONTROL

- Energy Management
- Home Security
- **Lighting Control**

298

- Safety Monitoring
- Appliance Control

May 1982 © BYTE Publications Inc

#### THE HOMEBRAIN<sup>™</sup> IS

## C D

A - 32 Channels

-RS232

- **Buffered Input**
- -8 Relay Output -Uninterruptable Power Supply
- -CPU, Communications, 256 Channel AC Wireless Con-

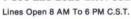
#### the First Total Home Control Computer

- Communicate with the HOMEBRAIN™ using your personal computer RS232 Inter-
- HOMEBRAIN™ controls your home using your define logic sequences
- Logic diagrams, timers, counters, alarm clocks, calendars, are directly implemented by the HOMEBRAIN™ microprocessor
- HOMEBRAIN™ logs controlled operating times for the month

The HOMEBRAIN TH operates totally inde pendent of your personal computer. Crashing your computer will not crash HOMEBRAIN ™ leaving your home defenseless.

#### EVALUATE THE HOMEBRAINTM

Order Now By Calling Toll-Free 1-800-228-2028 EXT. 332



Just give us your Name, Shipping, Address and Visa or MasterCard number and we will charge the \$750.00 purchase price, plus \$20.00 shipping (N.J. residents add 5% sales tax) to your account. Or, SEND\*
your CHECK\* or MONEY ORDER\* to:

#### HYPERTEK, INC **30-4 FARM ROAD** SOMERVILLE, NEW JERSEY 08876

\*Sending your check will qualify you for an INTRODUCTORY REBATE of 10%. Allow 6-8 weeks for delivery



The Beginner's Book, Third Edition by Adam Osborne and David Bunnell One of our most popular titles, Volume 0 has been expanded and revised to include new sections on software and communica-

tions. Written for the complete novice, this book introduces the construction and operation of microcomputers. Paper \$7.95.

#### 6502 Assembly Language Subroutines by Lance Leventhal and Winthrop Saville

This book includes over 50 indispensible, ready-to-use subroutines. A boon to every 6502 programmer, it will save hours of programming time. Includes array, bit and string manipulation, sorting and searching operations, much more. Paper \$12.99

#### Assembly Language Programming for the Apple IITM by Robert Mottola

This comprehensive, easy to understand introduction provides solid groundwork for getting started in assembly language programming on the Apple II. Many subroutines written in assembly language are provided, and most explanations are shown with equivalent examples in BASIC. Paper \$12.95.

#### Discover FORTH: Learning And Programming the FORTH Language by Thom Hogan

Using a friendly approach, the author explains the history and uses of FORTH, as well as how to program to an intermediate level. Includes notes on logical extensions and alterations to the current standard FORTH syntax. Paper \$14.95.

Atari® home computer users. This "how-to" guide written for the novice covers all the common external devices, including disk drives and printers. The reader can also learn to program in Atari® BASIC. Paper \$15.00.

#### **Trade Secrets:** How to Protect Your Ideas and Assets by James Pooley

Attorney James Polley provides legal advice on a "hot" topic: who owns your ideas in today's business world. Employers can learn to tighten company security systems and protect their intellectual assets. Employees can become familiar with their rights to take "commercial" ideas to new jobs or start competing businesses without being sued. Cloth \$19.95.

#### A User Guide to the UNIX™ System by Rebecca Thomas and Jean Yates

Designed to ease the novice through the difficult learning stages, this volume is also an excellent reference for those already familiar with the UNIX™ operating system. Computer-side tutorials teach forty basic commands plus there's a list of UNIX™ system resources, and a bibilography for further study. Paper \$15.99.

#### VisiCalc®: Home and Office Companion by David M. Castlewitz and Lawrence Chisausky with Patricia Kronberg. Illustrated by L. D. Chukman

Contains 50 models that can be used immediately for personal and business applications. Provides models for loans and investments, advertising and sales, inventory control, personnel, household aids and more. Designed to accomodate most micros and every version of the VisiCalc® program. Paper \$15.99.

Now at your dealer, or write Osborne/McGraw-Hill, 630 Bancroft Way, Berkeley, CA 94710. Phone orders: CALL TOLL FREE 800-227-2895. In California call 415-548-2805. Canadian orders contact L.A. Varah (416) 561-9311, McGraw-Hill-Ryerson (416) 293-1911.

Atari® 400/800TM are trademarks of Atari, Inc. PETTM is a trademark of Commodore Business Machines, Inc. CURSORTM is a trademark of The Code Works, UnixTM is a trademark of Bell Laboratories. Apple II<sup>®</sup> is a registered trademark of Apple Computer, Inc. VisiCalc<sup>®</sup> is a registered trademark of VisiCorp.

### **Book Review**

#### Fifty BASIC **Exercises**

Jean-Pierre Lamoitier Svbex Berkeley, CA, 1981 253 pages, softcover \$12.95

Reviewed by Paul Swanson 97 Jackson St. Cambridge, MA 02140

While BASIC is widely acclaimed as an easy-to-learn, easy-to-use programming language, teaching vourself BASIC can be a problem. The manuals that accompany many computer systems are very dry, and while you can learn BASIC (Beginner's Allpurpose Symbolic Instruction Code) from them, they serve better as reference manuals than teaching guides. Some computers do come with teaching guides, but these generally explain BASIC at a very elementary level, using simple text and cartoons.

For those who don't want to learn by trial and error with a manual designed for reference, but want a more intellectually written teaching guide than the cartoon approach, Fifty BASIC Exercises by Jean-Pierre Lamoitier could be the book you're looking for. This book uses the learnby-doing approach, a truly effective teaching method, well suited to programming. In the introduction, the author cautions that the book assumes some background in a scientific or technological field. I think a mathematical background in particular would be most helpful to the reader; a few of the included programs are based on mathematical algorithms that are not exactly on the tip of everyone's tongue. There is sufficient explanation, however, so that even if you aren't familiar with the mathematics you can still learn something about BASIC from the program. Then too, you might try using a reference book such as the C.R.C. Standard Mathematical Tables to help you with the math.

Two chapters of introductory material include discussions of flowcharting and a few basic rules and techniques, along with some simple programs to write. The remaining chapters are divided into such topics as "Elementary Exercises in Geometry," "Financial Computations." and "Statistics." Each chapter builds on the information presented in the previous chapters, and each set of new material is accompanied by at least one exercise. The exercises, which are all short BASIC programs, cover many problems commonly confronted in programming, such as finding the number of days between two dates, calculating loan repayments, sales forecasting, and several calculations involving income

The programs in the book were designed to run on the Radio Shack TRS:80 and so will run with some minor changes on any system using Microsoft BASIC. Where the differences in BASIC are important, Lamoitier discusses them.

The book was translated from French and may have lost a few things in translation. The glossary, in this English version at least, is missing, and this is a serious drawback. Definitions are the most common barrier to anyone learning a new subject, and a computer language is certainly no exception. A better index would also help: as it stands, the index fails to cover many of the subjects that are in the text, and the ones that are included are listed with

single page references, which makes it very difficult to relocate topics that appear in several places throughout the book. I don't know if the French version has a better index but I find it hard to believe that no one thought to include a glossary.

From my observations, a person learning BASIC or any other first language on computers seems to go through four phases. The first, or orientation, phase is when any fears of the computer are dispelled and the rudiments of operating it are learned. This is well covered in the first two chapters alone. This brevity is geared toward the reader who is serious about, and adept at, learning, in which case more discussion at that level would be boring. The rest of the book deals quite successfully with the second phase, during which the programmer-to-be learns to write programs with loops and more sophisticated algorithms. The third phase, which the book should leave the reader ready to pursue, is when the programmer starts using a very structured approach and tackles applications that may use the programs written in phase two as interim calculations. (The fourth phase, which I see as learning data file manipulation on a large scale, is not important here.) My purpose in mentioning these phases is to state one more point about this book: in order for the person learning BASIC to be ready for the third phase, that person should be familiar with subroutine use. Lamoitier uses subroutines quite effectively in the exercises and, further, discusses organizing, or structuring, the program in general. However, I would have liked more explanations of how the subroutines fit into the scheme of structuring; as programs get more sophisticated, subroutine use gets more important.

But in general, Fifty BASIC Exercises is a worthwhile book. It has its shortcomings, for while the need for more discussion on subroutines can be argued, I think that most readers of the book will agree that it would benefit considerably from a glossary and an expanded index. Nevertheless, it should serve the novice well as a practical and intelligently written guide to the fundamentals of BASIC programming.

#### **BYTE's Bugs**

#### **Mystery Coll Turns** Up in Circuit Cellar

Several readers contacted us with a complaint about Steve Ciarcia's article "Build a Computerized Weather Station" (see the February 1982 BYTE, page 38). An inductive coil labeled only "\*L1" appeared in the schematic diagram of figure 11b on page 64 with no explanation of its origin or value.

Coil L1 is meant to be wound by hand from eight turns of number-26 copper wire around a coil form with an inside diameter of onequarter inch.

We apologize for the omission of this information, which should have been placed in the figure caption.

Thanks to Rick Parrot of Data General in Apex, North Carolina, and to others for pointing out this error.



# GOT So on to SEE HOW MUCH MORE WORD PROCESSING YOU CAN GET FOR LESS FROM EXXON OFFICE SYSTEMS.

If you're just starting out in word processing. Expanding. Or want to start over. You owe it to yourself and your business to see the new Exxon 500 Series Information Processor.

It makes word processing easier. Unlike most, it's not menu-bound. So operators don't get bogged down with lists.

It has an Explain key to help the operator along. All gueries are answered

on the screen. In plain English.

It comes with a 50,000-word dictionary. It spots misspellings and corrects them. Automatically. You can even teach it more words. Up to 10,000 more. Words that are special to your business or profession.

The 500 Series is the word processor to start with. Compare. We think you'll agree that it does more, more easily, for less.

And what you start with you can stay with. Its modular design allows for future enhancements such as increased communications with other machines, including computers. Additional state-of-the-art software and programmability to handle a wide range of applications. Seeing is believing.

Mail coupon or call toll-free for a demo: 800-327-6666. In Conn. 800-942-2525. See how the 500 will fit your business.

#### START WITH US. STAY WITH US.

Exxon	Office Systems Company
P.O. B	ox 10184
Stamf	ford, CT 06904

- Please send me your "Start with us. Stay with us." product information kit on your new 500 Series Information Processor.
- ☐ I'd like a demonstration. Have your representative call me.

NAME

TITLE

COMPANY

ADDRESS

CITY

STATE

Circle 169 on inquiry card.

## **Book Review**

#### Programmer's Gulde to the 1802

Tom Swan Hayden Book Company Rochelle Park, NJ, 1981 156 pages, softcover \$7.95

Reviewed by Harley Shanko 15025 Vanowen, #209 Van Nuys, CA 91405

Users of the 1802 8-bit microprocessor are sure to enjoy Tom Swan's Programmer's Guide to the 1802. It is written in such a way that the novice should be able to understand quickly the 1802 instruction set and begin writing assembly-language programs; yet the more advanced programmer should find this book useful also. The author's style and occasional interiections of humor make for easy reading, with references and comparisons that simply and clearly illustrate the subject matter.

The book is divided into four sections. Beginning with "A System of Numbers-A Number of Systems," Swan quickly acquaints the reader with the hexadecimal number system. This foundation should allow the computer novice to proceed without difficulty through the next section, "Fundamentals of Assembly Language," to which one third of the book is devoted

Arithmetic and logic operations are explained, using binary and hexadecimal examples to introduce various computer instructions (add, subtract, carry/borrow, complement, AND, OR, exclusive OR, and shift). Then program flow (branch, skip, and call) and data flow (load and store) are covered, as well as register control, input/output, and other features and instructions unique to the 1802. The last ten pages of this section use assembly-language routines as examples to introduce certain programming concepts.

A quarter of the book is spent clearly explaining the 1802 instruction set. Each instruction mnemonic is defined, its symbolic actions are represented, and a textual discussion and programming example are included. Sprinkled throughout the book are illustrations, tables, and figures, all courtesy of RCA; interestingly, these are not referred to by the author.

The last quarter of the book includes a thoroughly commented assembler and disassembler source listing and text describing it, a library of subroutines which can be used in many programs, and the answers to the examples included at various points by the author. The assembler does not support the use of labels, macros, or mathematical expressions; thus the user must assign starting addresses and branch and call addresses. Nevertheless, this line-at-a-time assembler allows a programmer to enter mnemonics, addresses, and immediate data, and frees him from error-prone mnemonicto-object-code conversion. The assembler can be run on small systems (21/2K bytes of programmable memory, minimum) and still provide space for assembling 1K bytes of object code.

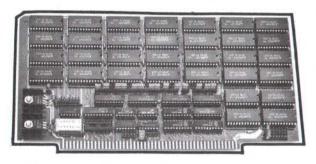
To test its usability, I installed the assembler in my homebrew 1802 system. Despite its limitations, the assembler does provide a means to enter a program in source form and get immediate display of valid entries (invalid entries are flagged with an ERROR message) via the disassembler, which overwrites the entry display. The assembled object code can then be run, saved, or programmed into an EPROM (erasable programmable read-only memory) if both hardware and software support these last two features. It is assumed that the user can write his own "handler" which normalizes the user system and the assembler interfaces and provides a keyboard/display for the assembler/disassembler. Depending on the operating system's register usage, this handler software can range from quite simple code to the rewriting of all the keyboard input, display output, and SCRT (Standard Call and Return Technique) routines. My handler used about 150 bytes, using existing keyboard and video-display subroutines.

In summary, this book is what 1802 users have needed for years. In fact, it might have been better received five years ago when I started into microcomputing, Still, it does provide the explanations necessary to clarify several points and better explain some of the interrupt-type instructions. For all except perhaps the most advanced 1802 programmers, this book should prove to be a worthwhile acquisition.

If you know **HUNTINGTON'S** DISEASE we need to know about you... and your parents. and your children. (it can make a big difference)



#### S-100 MEMORIES



#### **64K STATIC RAM**

150 ns 2Kx8 Rams Extended Addressing Bank Select Low Power Consumption Cromix, MPM Compatible

M12

\$625.00

#### 256 DYNAMIC RAM

150 ns Access-270 ns Cycle 8-or 16-Bit Data Parity Error Detection Extended Addressing **ROM Driven Bank Select** 

M23

\$945.00

**Industrial Quality FULL 12 Month Warranty** 

## indigo tech

(408) 727-4710 Master Charge and Visa 670 Nuttman Ave. No. 110 Santa Clara, CA 95050 Mainframe solutions at micro prices.

MDBS solves the problem of expensive, time-consuming application development and maintenance.

Here's what makes the MDBS Data Base Management System so unique:

ECONOMY—Our state-of-the-art system cuts application development costs by up to 80%.

EFFICIENCY—Data compression allows optimum use of space. HARDWARE COMPATIBILITY—From 8080, Z80...to the

PDP-11, MDBS delivers uniformly excellent results.

PORTABILITY—MDBS operates under most popular operating systems and languages, including CP/M, UNIX, IBM PCDOS, COBOL, BASIC, PASCAL, C, PL/1, FORTRAN, and many more.

INTEGRITY—RECOVERY, RESTART, and the ability to roll the data base back are available. Data base integrity is supported through advanced data structuring techniques.

AUTHENTICITY—MDBS is the first and only true and complete DBMS currently available on microcomputers.

CAPABILITY—Our system includes features you won't find anywhere else, at any price.

- Fully-integrated, dictionary-driven.
- Unparalleled data structuring ability—far superior to hierarchical, CODASYL, and relational approaches.
- Powerful, English-like query system entirely non-navigational. Fully supports spur-of-the-moment "what if" inquiries.
- Query nesting allowed. Automatic sorting of output tables.
- Built-in data security down to the field level. Data encryption capability.
- Performance tuning, including the ability to influence physical storage structures.
- Extremely fast retrieval even for large volume data bases.
- Multi-users capabilities including active and passive lockout.

MDBS is not restricted to the limitations of data base "pretenders" like file management systems.

To help make application development more effective and efficient, MDBS also offers extensive consulting services and professional training seminars.

## MDBS and other fine products are distributed in most countries through ISE.

For more information please contact:

In U.S.: ISE-USA P.O. Box 248 Lafayette, Indiana 47902 Tel: (317) 463-2581

In Germany: ISE-ADV/ORGA GERMANY Lipowskystr. 26 8000 Munich 70 Tel: (0 89) 77 60 23-4 In France: ISE-CEGOS Tour Chenonceaux 204, Rond-Point du Pont de Sèvres 92516 Boulogne Billancourt Cedex Tel: 620-61-04

In Switzerland and Austria: ISE-ADV/ORGA SWITZERLAND Mainaustraße 17 CH-8008 Zürich

CH-8008 Zürich Tel: (01) 32 02 70-1 Elsewhere:

ISE-INTERNATIONAL P.O. Box 248 Lafayette, Indiana 47902 Tel: (317) 463-2581



#### Professionals know the difference.

Note: For more about ISE see page 127

☐ Please call me immediately at	( )		
☐ Please tell me about your half☐ Please tell me about your thre☐ I'm enclosing \$105 in paymer seas; Indiana residents please☐ Please charge to my VISA	-day seminar e-day workshop at for the MDBS r add \$3.80 sales	tax)	ег-
Card Number	_Phone No		
Signature	Expira	tion Date	
Name.	Title		
Company			
Address			
City	State	Zip	
Phone			36
(area code)  MAIL TO: Vous local ISE affiliato		(ext.)	

## **Book Review**

#### TRS-80 Color Computer Technical Reference Manual

Tandy Corporation Fort Worth, TX 1981, 71 pages softcover, \$14.95

Reviewed by Yvon Kolya POB 22 Peterborough, NH 03458

I was astounded to see Radio Shack's TRS-80 Color Computer Technical Reference Manual on the shelf at the local Tandy Computer Center Store. After I had purchased it and began sifting through its information-packed pages, I realized what

an incredible find this book was.

Radio Shack, along with many other major computer manufacturers, has had a reputation of closely guarding all the information about its computer systems, releasing only the bare minimum of facts necessary to sell the computers and software. With the appearance of this manual, Radio Shack seems to be reversing this policy.

This book gives all the information that any TRS-80 Color Computer (Level I and II) owner might want to know. It covers memory maps, block diagrams, schematics, pin connections—everything that could be of interest to either a software designer or a hardware hacker.

#### The Inscrutable PIA

Unfortunately, this manual is not as explicit at it should be. Apparently, it was originally written for Radio Shack's internal use, and after it was finished, Tandy decided to release it to the general public. The descriptions and explanations are quite sketchy, and I found myself rereading the material in order to make sense of it. For example, the second paragraph on page 4 states:

The next two pages of the Map [Color Computer Memory Map] explain the addressing for the PIA's. In general, the even numbered locations are the I/O registers and the odd numbered memory locations are the control registers. Bit two of the control registers

determines what is addressed at the even numbered memory locations. If this bit is set high (logic 1) the data I/O register is addressed. If it is low the data direction register is addressed. Normally the data direction register is addressed only during initialization to allow configuration of the data inputs and outputs. (By clearing bit 2 and writing to the even numbered memory location one address below, each bit of the PIA may be set as an input or an output. A I in the data direction register sets the bit as an output and a 0 sets the bit as an input.)

When I proceeded to the corresponding diagram, I found it was not clear to which of many registers the paragraph

# All about LOGO how it was invented and how it works

"Changes the learning experience from a matter of discipline into one of discovery."

- Marvin Minsky, MIT

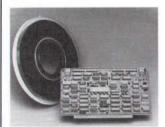
"A revolutionary book...required reading for anyone with an interest in computers, children, education, or the future." — 80 Microcomputing

# MINDSTORMS CHILDREN, COMPUTERS, AND POWERFUL IDEAS SEYMOUR PAPERT

Now in paperback, \$6.95

BASIC BOOKS, INC.
10 East 53rd Street, New York, NY 10022

#### S-100 USERS



#### INTERFACE 9-TRACK TAPE DRIVES

With the DTI - DMA Tape-Unit Interface

- Transfers data via DMA up to 200K bytes per second
- Allows full control over all tape-drive functions

#### SPEED NUMBER-CRUNCHING SOFTWARE 5-10 X's AND MORE

With the FMP – Fast Math Processor

- Kit or assembled
- 32-bit floating point operations for arith., trig., exponential, etc. functions
- Or 64-bit floating point operations for arithmetic functions

Both the DTI and FMP meet the IEEE S-100 standard. Software is available.

For further information contact:

A MEMBER OF THE SPC GROUP



#### SPC TECHNOLOGIES, INC.

P.O. Box 248, Arlington, VA 22210 (703) 841-3632

# WHY THE MICROSOFT RAMCARD MAKES OUR SOFTCARD AN EVEN BETTER IDEA.

Memory — you never seem to have quite enough of it.

But if you're one of the thousands of Apple owners using the SoftCard, there's an economical new way to expand your memory dramatically.

#### 16K ON A PLUG-IN CARD.

Microsoft's new RAMCard simply plugs into your Apple II,<sup>®</sup> and adds 16k bytes of dependable, buffered read/write storage.

Together with the SoftCard, the RAMCard gives you a 56k CP/M® system that's big enough to take on all kinds of chores that would never fit before (until now, the only way to get this much memory was to have an Apple Language Card installed).

# GREAT SOFTWARE: YOURS, OURS, OR THEIRS.

With the RAMCard and SoftCard, you can tackle largescale business and scientific computing with our COBOL and FORTRAN languages. Or greatly increase the capability of CP/M applications like the Peachtree Software accounting systems. VisiCalc<sup>™</sup> and other Apple software packages can take advantage of RAMCard too.

And RAMCard gives you the extra capacity to develop advanced programs of your own, using the SoftCard and CP/M. Even with the RAMCard in place, you can still access your ROM BASIC and monitor routines.

# JOIN THE SOFTCARD FAMILY.

The RAMCard is just the latest addition to the SoftCard family — a comprehensive system of hardware and software that can make your Apple more versatile and powerful than you ever imagined.

Your Microsoft dealer has all the exciting details. Visit him soon, and discover a great idea that keeps getting better.

Microsoft Consumer Products, 400 108th Ave. N.E., Suite 200, Bellevue, WA 98004. (206) 454-1315.

Soft Satt and RAMO and aim trudemans of Microsoft. Apple this aregistered hadomans of Apple Computer. Inc. 27-80 is a registered trademans of 2 log line. CPM is a registered trademans of 2 log line. CPM is a registered trademan of 2 log line. Per Microsoft in a rendemant of Personal Software line.



DON'T TYPE IT IN FROM THE KEYBOARD . . . POINT IT OUT ON THE SCREEN!

IIAT'S touch sensitive monitor gives you an alternative to keyboard entry DON'T TYPE IT IN FROM THE KEYBOARD . POINT IT OUT ON THE SCR IIAT's touch sensitive monitor gives you an alternative and fun.
The Keyboard entry and fun.

that's easier, faster,

13" Color Monitor with Integrated Touch Sensitive Bezel and Sense Circuitry: \$1595

Monitor Interface Card with cable and documentation

For Apple II: \$159 For IBM PC:\* For Atari 800:\*

DiscoVision or Sony Videodisk Interface Card with Monitor Interface, Cables and **Documentation** For Apple II: \$599 For IBM PC:\* For Atari 800:\*

PILOT plus™ CAI Course Authoring Software: \$150

IBM AND ATARI INTERFACES SCHEDULED FOR AVAILABILITY IN JUNE 1982. CALL FOR PRICE

ALL PRICES DO NOT INCLUDE SHIPPING COSTS.

#### FFATURING

- High Quality Color Monitor for super graphics and text
- Touch sensitive Bezel with 80 by 36 infrared sensing matrix for precise response with no loss of image quality
- High speed sensing circuitry for multipoint tracking
- Interfaces for Apple II, IBM PC and Atari 800 for flexibility
- PILOT plus™ software for programming power in Computer Aided Instruction (CAI)

#### USE IT for . . .

- **Education, Training & Testing**
- Order Entry and Processing
- **Process Control**
- Retail Point of Sale
- Database Query Programs
- Any application where you need quick and easy user interaction.

ALSO FROM HAT:

Finally . A professional graphics editor for the Apple. Written in machine simple. Now cost way to professional graphics editor for the Apple. I low cost way is used provides a simple. I low cost way is used provides a simple. I low cost way to simple to the cost way to simple to cost way to simple to cost way to provide a simple to cost way to cost wa Putting ACTION into interACTIVE computing

international institute of Applied Technology, Inc. of Applied Technology, 20010 Century Boulevard 20010 Century Maryland 20874 Germantown, (301) 428-9010

BARE APPLE AND APPLE II ARE REGISTERED TRADEMARKS OF APPLE TARI.

APPLE AND APPLE II ARE REGISTERED TRADEMARK OF COMPUTER SINC. ATARI BUO IS A REGISTERED TRADEMARK OF INC. BUT PLUS OF THE SINCE OF THE SINCE OF THE SINCE OF T

#### **Book Reviews**

was referring. In general, the explanations are too terse.

Section 1, which is 11 pages long, is devoted to a block diagram of the Color Computer and to a series of precise memory maps of the randomaccess memory.

These maps are very useful if you like to experiment with the different memory pages, modes, and displays. For example, I found out how to get limited higher-density video graphics on my Level I 4K-byte system after only a little experimentation, And using the POKE command to place a 0 into location FFD7 causes the system to operate at a clock rate of 1.8 MHz instead of the normal .89 MHz.

Section 2 is only two pages long and details the proper sequence of operations needed to disassemble the computer, as well as the reassembly procedure.

Section 3, "Theory of Operation," concentrates on the 6809E microprocessor, which is the heart of the TRS-80 Color Computer, and how it is interfaced to the outside world through the rest of the computer's components. Block diagrams, programming models, timing diagrams, cassette formats, and peripheral schematics are all included in the 26 pages that comprise this section. All of the components of the system are covered: joysticks, the RS-232C serial port, sound port, cassette port, and power supply.

The next section, labeled

"Troubleshooting," lays down general guidelines on where to look for the most common problems that you may encounter. Like the rest of the manual, the explanations do leave a lot unsaid and aren't very thorough. For example, the sound went out on my computer, and I discovered. much to my dismay, that the audio circuitry isn't covered in the troubleshooting section. However, using the schematics in the following sections, I was able to diagnose the problem and locate the bad chip on the circuit board.

Sections 5, 6, and 7 are gold mines for the hardware hacker. Section 5 features a complete list of all of the parts used in the Color Computer, including the screws! Section 6 is an actual-scale drawing of both the component side and the printed-circuit side of the computer board used in the Color Computer. Section 7, the last one in the manual, is composed of three 11 by 16 inch fold-out pages that give the complete circuit diagram of the Color Computer.

The TRS-80 Color Computer Technical Reference. Manual (order no. 26-3193) is a bit skimpy on the explanations, but the diagrams and schematics more than make up for these deficiencies. If you are interested in the hardware/interfacing aspect or the software aspect, or even if you're just curious about the machine, then I recommend this manual.

#### BYTE's Bits

#### Computer Stores Listed

A mailing list of all the known computer stores in the United States and Canada has been compiled by NACS (National Association of Computer Stores). Approximately 1500 stores are listed, and most entries contain

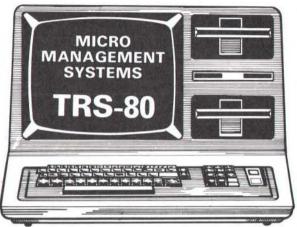
company name, street address, city, state, and zip code. The list is broken down by state and includes a number of entries for foreign countries.

The list is available for \$110. For details, contact the National Association of Computer Stores, 3255 South U.S.#1, Fort Pierce, FL 33450, (305) 465-9450. ■

# TRS-80 DISCOUNT ∽ BUY DIRECT ∽

WE SELL THE FULL LINE OF TRS-80'S AT WHOLESALE PRICES

\*\*\* PERSONAL COMPUTERS \*\*\*



MODEL II
26-4002 64K I Drive\$3279
Ask About Hard Drives
MODEL III
26-1062 16K\$819
26-1066 48K with
2 Drives, RS232\$2049
COLOR COMPUTER
26-3001 4K\$309
26-3002 16K Ext. Basic\$455
26-3003 32K Ext. Basic\$569
POCKET COMPUTER
26-3501 Pocket Computer\$155
COLOR COMPUTER DISK DRIVES
26-3022 Color Disk Drive #1\$498
26-3023 Color Disk Drive #2, 3, 4 \$338

•FAST DELIVERY FREE CATALOG THOUSANDS OF SATISFIED **CUSTOMERS** 

ORDER TOLL FREE

1-800-841-0860

# MICRO MANAGEMENT SYSTEMS, INC.

DEPT. NO. 1

115 C. SECOND AVE. S.W.

LARGE INVENTORY

CAIRO, GA. 31728

WRITE FOR YOUR

GA. 912-377-7120

TM TANDY CORPORATION FREE COPY OF WARRANTY UPON REQUEST

# **Programming Quickies**

# Structured Strings in BASIC

Dr. David W. Stockburger Psychology Department Southwest Missouri State University Springfield, MO 65802

The applications programmer often needs to create a sequence of events to direct the activity of a program. In many cases, the events are repeated at various levels within the sequence. The following describes a general-purpose routine in BASIC that allows the programmer to create a great variety of structured strings easily; these strings may then be used to sequence events in control programs. It has potential use in music generation, industrial control, robotics, and animation.

As an example, suppose a program to demonstrate animation techniques had 26 possible screens or displays, each symbolized by a small letter *a* through *z*. Input to this program might be in the form of a string (e.g., < aabzzcabzrabz > ), which would sequentially display

the screen associated with each small letter. These strings can be constructed and entered by the user. This may be a laborious task, however, if the input strings are long and complicated. Because it is likely that some patterns of small letters are repeated within the final string, considerable time and effort can be saved by creating a production system that inputs strings of capital and/or small letters (e.g., <abable 2000) and produces strings consisting of only small letters (e.g., <aaabccdefcddd>). A set of production rules govern the replacement of any capital letter by a string of capital and/or small letters.

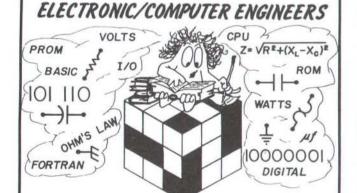
In this routine, an initial string of capital and/or small letters entered by the user is expanded until a string with only small letters remains; this last string is called the structured string. The expansion is performed by user-defined production rules. A production rule is a string that begins with a capital letter and is followed by capital and/or small letters.

The routine works by setting the pointer to the first letter in the initial string and examining that symbol. If it is a small letter, the routine increments the pointer and repeats the process. If it is a capital letter, it expands the initial string by replacing the capital letter with all symbols that follow it in the appropriate production rule. The pointer is *not* incremented in this case and the process is repeated, beginning at the position of the first letter of the newly inserted string. If a symbol is encountered that is neither a capital letter for which a production rule has been defined nor a small letter, the routine will generate an error. The routine will repeat the above process until the expanded string contains only small letters or until a string longer than some predefined length results. The flowchart for this routine is presented in figure 1.

For example, given the following set of production rules:

AaabbB Bcccd CeAe DABCD

and the initial string  $\langle CD \rangle$ , the routine proceeds as follows: it initially sets the pointer (p) to 1 and expands  $\langle C \rangle$  in  $\langle CD \rangle$ . The result is the string  $\langle eAeD \rangle$ . When the routine now finds a small letter  $\langle e \rangle$  in the



YOU SPENT LONG HOURS STUDYING TO GET YOUR DEGREE, BUT NOW YOU'RE PUZZLED ABOUT WHERE YOU CAN GO TO BEST USE THOSE SKILLS.

WARNER ROBINS AIR LOGISTICS CENTER offers a civil service career as an engineer with a chance to work with state-of-the-art technology to support the most advanced defense weapons systems in the world.

Warner Robins ALC will hire approx. 180 electronic/computer engineers in 1982. For more info. call toll free 1-800-841-9193 or 1-800-342-0570 (in Georgia) or write to: DPCSC-Employment office, Robins A.F.B., Georgia 31098

WARNER ROBINS AIR LOGISTICS CENTER

ROBINS A.F.B., GEORGIA 31098





## YOU DON'T HAVE TO PAY AN ARM AND A LEG FOR DEMONSTRATION SOFTWARE!



#### Supercharge Your Micro's Performance With



#### The Professional Operating System with CP/MTM Compatability

- \*Spectacular Performance. Programs run 3 to 10 times faster compared with TRSDOS or CP/M Benchmark results up to 20 times faster obtained with some applications by independent firm!
- . Double-Sided Drive Support. Provides 1 25 Megabytes of storage per 8" double-sided/density disk Intermix any combination of single- or double-sided drives on line
- •Expanded Directories. Store larger number of files and more information per disk
- Automatic Density/Side Recognition. Detects changes in disk formal automatically. Change disks at any time without compromising data or "BDOS/Read-Only" errors

  Fast Disk Backups. Copy a complete 8" SS/DD diskette (610K) in less than 80 seconds. Copy a
- double-sided/density diskette (1 25 Megabytes) in less than 1 minute 45 seconds
- Hard Disk Drive Support. Supports large hard disks in excess of 1,000 Megabytes without partitioning ·Advanced Utilities. Complete set of disk utilities, system,date and time functions, communications
- channel interface, etc. provided as standard features. •Enhanced Automatic Print Speeling. Run multiple printers simultaneously, support for multiple
- queues and printers is standard feature on spooling versions •CP/M Compatibility. Virtually any CP/M (version 2.x) program will run under TURBODOS without modification. Also fully media compatible with standard CP/M-format diskettes
- Advanced Mainframe-like features. Includes read-after-write validation of all disk update operations. type-ahead buffers, incremental disk backup utility, password/log-on security, system date and time functions, accepts string of multiple commands, and numerous other capabilities not available under CP/M or TRSDOS Multi-user, networking versions also available

TRS-80 Model II and Xerox 820 versions Special Introductory Price

Dealer and OEM inquiries invited

Data-Rx.Inc.

Easily adaptable to any Z80-based computer.

(408) 375-2775 • 686 Lighthouse Avenue • Monterey, 93940

TURBODOS is the registered trademark of Software 2000 CP/M, MP/M, and CP/NET are registered trademarks of Digital Research

#### QUALITY parts at DISCOUNT PRICES SUPER SMALL PHOTO FLASH 170 MFD 330 VOL BLACK PLASTIC JOYSTICK CASE AC-TEC RECISION FD 330 VOLT 1 1/4" x 7/8" 2 for \$1.50 10 for \$7.00 SERIES C CONTAINS 4 Pr. 50K CENTER 0440 TAPPED ALPS BLACK PLASTIC ENCLOSURE ADJUSTABLE HEIGHT FROM POTS 500 K LINEAR SLIDE POT \$4.75 each 1.63" TO 2.93"; WIDTH 6.85"; DEPTH 8". BUILT-2 7/8" LENGTH 1 3/4" TRAVEL 75¢ EACH ECIAL MRF 901 IN STAND OFFS FOR P.C. MICROWAVE TRANSISTOR BOARDS..FRONT AND BACK PANELS NOT INCLUDED.. COMPUTER \$2.50 EA GRADE \$5.25 PER CASE CAPACITOR 700 mfd. 150 VDC \$2.00 2 1/2" DIA X 4 3/4" HIGH SEND FOR NEW 1982 Free! 40 PAGE CATALOG Free 3,600 mfd. 14 CONDUCTOR L.E. D.'s \$1.00 RIBBON CABLE STANDARD JUMBO 6,400 mfd. 1 DIFFUSED 60VDC \$2.50 /8" DIA X 4 1/4" RED 10 FOR \$1.50 12,000 mfd. 40 VDC \$3.00 GREEN 10 FOR \$2.00 YELLOW 10 FOR \$2.00 18,000 mfd. 75 VDC \$4.00 FLASHER LED / 20,000 mfd. 25 VDC VOLT OPERATION SCOTCHFLEX #3365 2 " DIA. X 2½" HIGH 22,000 mfd. 15 VDC 2" DIA X 2 1/2" HIGH HIGH \$2.00 JUMBO SIZE 28 AWG STRANDED GRAY WITH RED MARKER 22,000 mfd. 40 VDC 2" DIA. X 6" 2 FOR \$1.70 10 FEET for \$2.50 POLAR LED 100 FOOT ROLL \$12.00 2 FOR \$1.70 SUB MINI LED **TRANSFORMERS** 25,000 mfd.75 VDC \$4.50 120 volt .079" X .098" 45.000 mfd. 25 VDC 72,000 mfd. 15 VDC 20 m A at 1.75 v 10 FOR \$1.00 primaries 6 VOLTS at 150 mA 12 V.C.T. at 500 mA \$1.25 QUANTITY PRICES AVAILABLE \$2.50 16.5 V. at 3 AMPS 18 VOLTS at 350 MA 18 VOLTS at 1 AMP CORP. **ELECTRONICS** \$4.50 TERMS 25.2 VCT at 2.8 AMP \$5.50 905 S. Vermont Ave. uantities Limited in Order \$10.00 dd \$ 2.50 hipping USA allf. Res. Add 6% rompt Shipping P.O. BOX 20406 Los Angeles, Calif. 90006 (213) 380-8000 FLAT LEVER MINI-TOGGLE S.P.D.T. (ON-ON) 5 AMP @ 120 V/ C6K # 7105 \$1.00 EACH 10 for \$8.50 100 for \$7 Mon. - Fri. Saturday 9 AM - 5 PM 10 AM - 3 PM

#### Programming Quickies \_

first position of the string, it increments the pointer and examines the second letter in <eAeD>, which is <A>. Finding a capital letter, it looks it up in the set of production rules, finds it, and expands the string to <eaabbBeD>. The next capital letter to be expanded is <B>, and the expanded string would now be <eaabbcccdeD>. Continuing the process would yield <eaabbcccdeABCD>, which could be infinitely expanded. The routine would stop, however, because the pointer would have become larger than the limit set by the user.

The BASIC routine (written in Poly Disk BASIC for a Poly-88 computer) as described above is presented in listing 1. The production rules are read in as data statements in the string variable T\$. If different production rules are desired, they may be substituted or added to the existing data statements. If a number of different production systems are desired, it would probably be easiest to store them in mass storage, such as disk or tape files, and read them into T\$ as desired.

The string variable A\$ is used for both the input and output string. The user inputs the initial string into the routine through this variable, and the routine returns the expanded string back into this variable. The routine uses the BASIC commands RIGHT\$, LEFT\$, and MID\$ to accomplish the expansion. (This should pose no problem for most BASICs.) Examples of the results of the routine are presented in listing 2.

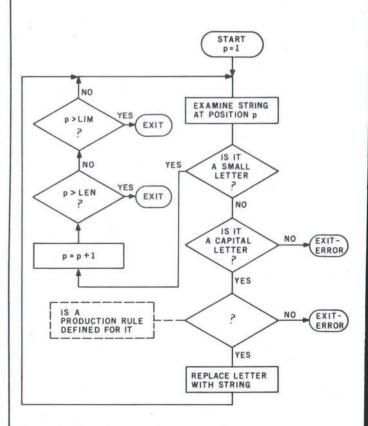
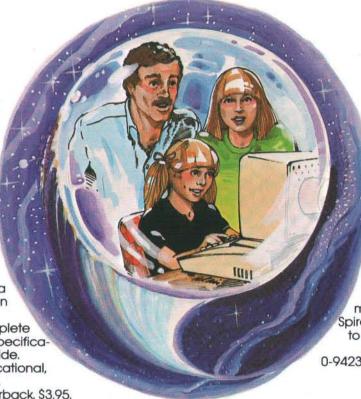


Figure 1: Flowchart for the structured string-generation program in listing 1.

# With COMPUTE! Publications

#### The Beginner's Guide To Buying A Personal Computer

A Novice's handbook of useful, helpful information designed to teach you the basics of evaluating and selecting a personal computer. Written in plain English for the interested beginner. Complete with personal computer specification charts and buyer's guide. Applicable to home, educational, and small business buyers. ISBN 0-942386-03-5. Paperback. \$3.95.



#### **Inside Atari DOS**

**COMPUTE!'s** 

From the authors of the Atari Disk Operating System, an exciting step-by-step guide to the DOS software. Complete with listings of commented source code and detailed explanations of each module of code. Author: Bill Wilkinson, Optimized Systems Software, Inc. Spiral bound for ease of access to listings. For Intermediate to Advanced Atari Users. ISBN 0-942386-02-7. Paperback. \$19.95

#### First Book Of PET/CBM

256 pages of Commodore PET and CBM articles from **COMPUTE!** magazine issues now out of print. Includes such classic articles and programs as "Feed Your PET Some Applesoft," "Disk Lister: A Disk Cataloging Program." and "Cross Reference For The PET." Spiral bound for ease of access. ISBN 0-942386-01-9. Paperback. \$12.95.

**COMPUTE! Books** invites dealer inquiries. Call the Toll Free Number below for Dealer Information.

ATARI is a registered trademark of Atari, Inc.
PET and CBM are trademarks of Commodore Business Machines, Inc.

#### **COMPUTE!'s First Book Of Atari**

192 pages of useful, informative applications and programs from **COMPUTE!** magazine issues now out of print. Includes previously unpublished information including Memory Map. Contents include such articles and programs as "Adding A Voice Track to Atari Programs," "Designing Your Own Atari Graphics Modes," and "Inside Atari BASIC." Spiral bound for ease of access to listings. For Beginner level to Advanced Atari users. ISBN 0-942386-00-0. Paperback. \$12.95.

To Order COMPUTE! Books	Please send me:			
Send coupon to	Quan.	Price	Shipping/Handling	
COMPUTE! Books. P.O. Box 5406. Greensboro, NC 27403 USA	Beginner's Guide	\$ 3.95 ea.	+ \$1.00 ea	
For fastest service, in the US call	First Book of Atari	12.95 ea.	+ 2.00 ea	
	Inside Atari DO\$	19.95 ea.	+ 2.00 ea	
Toll Free 800-334-0868	First Book of PET/CBM	12.95 ea.	+ 2.00 ea	
In NC call 919-275-9809.			Total _	
All orders must be prepaid (money order, check or charge). All payments must be in US funds. (Outside the US add \$4.00 shipping and handling for	Name			
air mail, \$2.00 for surface mail.) NC residents add 4% sales tax.	Address			
Payment Enclosed	C#	CI-A-	71-	
Please charge my VISA MasterCard American Express	City	State	e Zip	
Account No. Expires /	Country			
	Aller and Aller and the Annual of the Control of th	alon a ufoco d	ally car allay 2.2 months	Don

311

Programming Quickies \_

**Listing 1:** The structured string-generation program (written in Poly Disk BASIC). In practical applications, this program would be used as part of a larger program.

```
10 REM *****
                STRINGS
                         *****
20 REM A PROGRAM TO GENERATE STRUCTURED STRINGS
30 REM
40 REM Copyright, 1981 by David W. Stockburger
                           PSYCHOLOGY DEPARTMENT
50 REM
                           SOUTHWEST MISSOURI STATE UNIVERSITY
60 REM
                           SPRINGFIELD, MISSOURI 65804
70 REM
80 REM
90 DIM S$(1:400)
100 REM CONTAINS STRING TO BE GENERATED
110 DIM T$(26:20)
120 REM CONTAINS PRODUCTION RULES
130 DIM A$(1:1)
140 REM TEMPORARY STRING USED BY STRINGS
150 REM
160 REM READ IN TRANSFORMATION STRINGS TO BE USED
170 REM N IS THE NUMBER OF TRANSFORMATION STRINGS
180 N=10
190 FOR I=1 TO N
200 READ T$(I)
210 NEXT
220 DATA "Asabbee"
230 DATA "Bodefsh"
240 DATA "CLABL"
250 DATA "Dxsz"
260 DATA "Etiser"
270 DATA "Fnnop"
280 DATA "GvFZeeD"
290 DATA "HGCEH"
300 DATA "IwwzcbDBACH"
310 DATA "Zmmm"
320 REM
330 INPUT "Enter maximum length of expanded string (1 to 300)
340 INPUT "ENTER STRING TO BE EXPANDED
350 GOSUB 430
360 PRINT S$
370 INPUT "Do you wish to continue (Y or N)?
375 PRINT
380 IF AS="N" THEN STOP
390 IF A$="Y" THEN 340
400 GOTO 370
410 REM
420 REM
                  SUBROUTINE TO EXPAND STRINGS
430 REM *****
440 REM
450 P=0
460 REM P IS POSITION IN STRING
470 REM FIND CURRENT LETTER
480 P=P+1
490 IF POL THEN RETURN
500 IF P>LEN(S$) THEN RETURN
510 A$=MID$(S$,P,P)
```

# NO COMPROMSE



#### **No Compromise in Performance**

- Main-frame type memory mapping for optimal BANK SWITCHED applications or 24-BIT extended addressing
- ☐ Operates in any S-100 System IEEE/696† or non IEEE
- ☐ DMA operation fully supported†
- ☐ 8/16 data transfer protocol+
- Up to 6 MHZ with no wait states; Up to 10 MHZ with automatic wait state assertion
- ☐ Parity error detection+
- ☐ Double parity in 16-BIT operation

#### No Compromise in Features

- All memory/refresh cycle timing is generated ON BOARD providing easy CPU independent characterization
- ☐ Ideal for use with the new generation of operating systems: CP/M-80,™\* CP/M-86,™\* MP/M-11,™\* MP/M-86,™\* OASIS,™\*\* UNIX,™\*\*\*\*

#### No Compromise in Quality

- ☐ Multilayer board and bus signal filtering for noise-free operation
- ☐ Thorough 100% final test and burn-in

#### No Compromise in Versatility

- Manual provides source listing and complete installation guide for MP/M-II™ BANK SWITCHED multi-user applications
- □ For the CP/M-2.2™ user: Manual includes implementations of 'Virtual Disk' for solid state disk/file applications

#### No Compromise in Customer Support

- ☐ Comprehensive technical manual
- ☐ User hot-line
- ☐ Full one year parts and labor warranty

†In accordance with IEEE-696 standard Registered trademarks of: \*Digital Research, \*\*Phase I, and \*\*\*Bell Labs.

#### **ORDER NOW**

#### (213) 887-5737

If you wish, send a check or money order for \$1,379 (in California add 6% sales tax where applicable).

Manual available at \$25.00 each refundable with order.

MACROTECH International Corp., 22133 Cohasset St., Canoga Park, California 91303



MACROTECH International Corp., 22133 Cohasset St., Canoga Park, California 91303

#### **Programming Quickies**

Listing 1 continued:

520 IF A\$>="a" AND A\$<="z" THEN 470

530 IF A\$<"A" OR A\$>"Z" THEN 670

540 REM THE LETTER IS A CAPITAL

550 REM CAN EXPANSION LETTER BE FOUND?

560 J=0

570 FOR I=1 TO N

580 IF A\$=LEFT\$(T\$(I),1) THEN J=I

590 NEXT

600 IF J=0 THEN 720

610 REM IF J=0 THEN NO EXPANSION LETTER WAS FOUND

620 REM NOW EXPAND USING J

630 L1=LEN(T\$(J))-1

640 L2=LEN(S\$)-P

650 S\$=LEFT\$(S\$,P-1)+RIGHT\$(T\$(J),L1)+RIGHT\$(S\$,L2)

660 GOTO 510

670 REM ERROR - SYMBOL IN STRING NOT A CAPITAL OR SMALL LETTER

680 PRINT "ERROR IN INPUT STRING OR PRODUCTION RULE"

690 PRINT "THE INCORRECT SYMBOL WAS " + A4

700 PRINT

710 RETURN

720 REM ERROR - PRODUCTION RULE NOT FOUND IN TRANSFORMATION TABLE

730 PRINT "CAPITAL LETTER NOT A PRODUCTION RULE"

740 PRINT "THE INCORRECT SYMBOL WAS ", A\$

750 PRINT

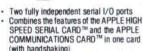
760 RETURN

## **NEW \* APPLE II PRODUCTS**

#### \* DUAL COMM PLUS™ TWO SERIAL PORTS



NEW



Thumbwheel switches select the Apple slot locations, Sixteen switch selectable baud rates for each port (50 to 19200 baud)

 On-board firmware provides extensive printer and U/L case terminal/modem support. Great with an 80 x 24 card and a Novation CAT or Hayes Smartmodem

 Can be programmed for async., sync., or even SDLC operation. Supports interrupts. Uses Z80 SIO chip.

LIST PRICE: \$239.00 MANUAL ONLY: \$15.00

#### \* MEMORY PLUS ™ 16K RAM EXPANSION



- · Add another 16K to your 48K APPLE
- Works with PASCAL, DOS, CP/M, FORTRAN, COBOL, PILOT, Personal Software's VisiCalc, INTEGER and APPLESOFT BASIC. Many other Apple software packages benefit from the additional storage provided by the MEMORY PLUS card.

 Three LED's show memory select and read/write protect status

 Toggle switch to shut the card off or to select between the standard monitor ROM or the on-board firmware socket. The firmware socket can hold an alternate Apple monitor ROM or a 2716 program (user provided).

LIST PRICE: \$149.00 MANUAL ONLY: \$15.00

All Bit 3 Apple products features:

 Easy plug-in installation • Operation with PASCAL Z80 SOFTCARD <sup>™</sup>, APPLE II and APPLE II PLUS

50/60 hz operation





#### FULL-VIEW 80 ™ 80 X 24



- Permits selection of 80 column or Apple 40 column/graphics on a single monitor via keyboard or program control
- 8 x 10 cell size upper/lower case character set with full lower case decenders
- User definable EROM character sets via 2716 (127 chars) or 2732 (255 chars)
- On-board 2K firmware supports HTAB, VTAB, U/L case keyboard, DATAMEDIA CONTROL CODES, INVERSE/NORMAL VIDEO, and a special printer driver
- Low power requirement
- Easy installation just plug it in!
   Compatible with many 80 column word processors
- Compatible with the D.C. Hayes MICROMODEM ™

LIST PRICE: \$379.00 (2716 std. char set) MANUAL ONLY: \$15.00

BIT 3 COMPUTER CORPORATION 8120 Penn Avenue South • Suite 548 Mpls., MN 55431 • (612) 881-6955

Apple II is a registered trademark of Apple Computer, Inc.; Z-80 Softcard is a registered trademark of Microsoft Consumer Products.

D.C. Hayes Micromodem is a trademark of D.C. Hayes, Associates, Inc.; Novation CAT is a registered trademark of Novation, Inc.

# LOGO Language of the 80's

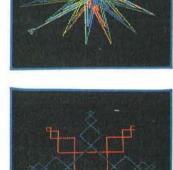
Apple Logo and Logo introduce you to a dynamic new computer language that not only enables educators to make full and innovative use of the teaching potential of modern computers but also offers programmers an easy-to-use system of considerable power.

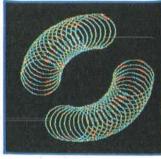
Readers of this book will see that the designers' vision of Logo as a virtually unlimited educational tool has now become a reality. Logo enables even young children to use the computer in rewarding, self-directed projects, while at the same time providing sophisticated users with a powerful and expressive general programming system. This book presents the reader with a complete guide to the exciting applications of this unique procedural language.

The author introduces programming techniques through Turtle Geometry—a series of fascinating exercises involving both Logo programming and geometric concepts. Later chapters illustrate more advanced projects that utilize Logo's sophisticated listprocessing capabilities; these include the conversational DOCTOR program with its simulated psychotherapist and an INSTANT program with which parents and teachers can create a programming environment for preschool children. The book also contains reference material of enduring value to sophisticated users.

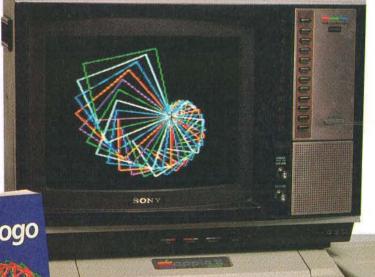
Get in on the ground floor of the burgeoning Logo movement with this comprehensive, detailed guide to the up-and-coming computer language of the Eighties!

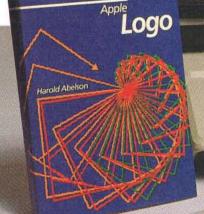
This book is published in two versions: *Apple Logo* is for users of Apple Logo<sup>TM</sup> software (distributed by Apple Computer Company) and contains an appendix for users of TI Logo<sup>TM</sup>. *Logo* is specifically for users of Logo software developed at MIT for the Apple II computer (distributed by Krell Software and Terrapin, Inc.). Logo also contains appendices that enable users of Apple Logo<sup>TM</sup> and TI Logo<sup>TM</sup> to carry out the projects in the book. Be sure to specify Apple Logo or Logo when ordering!











Apple Logo \$14.95 240 pages,

Logo \$14.95 240 pages.

softcover, illustrated

softcover, illustrated

ORDER TOLL FREE 800-258-5420

BYTE Books 70 Main St Peterborough, N.H. 03458

#### **Programming Quickies**

Listing 2: Examples of structured string generation from program in listing 1. The production rules used are given in lines 220 through 310 of listing 1.

ENTER STRING TO BE EXPANDED sdefslkigwZBCD sdefslkiawmmmcdefshtaabbcccdefshtxyz Do you wish to continue (Y or N)?

ENTER STRING TO BE EXPANDED CAPITAL LETTER NOT A PRODUCTION RULE THE INCORRECT SYMBOL WAS

JOT

Do you wish to continue (Y or N)?

ENTER STRING TO BE EXPANDED EFG tisernnorvnnormmmeexsz Do you wish to continue (Y or N)?

#### Cautions

Remember:

•The string variable A\$ must be dimensioned longer than the cutoff limit given to the routine because, upon exiting the routine, the expanded string may contain both small and capital letters to the right of this length. The additional length needed will depend upon the type of production rules that have been employed.

•The replacement string of a production rule may not

contain the capital element in the first position. For instance, AAa is not permitted because first position would never be expanded to a small letter. More complex versions of the same phenomenon may occur when replacement rules cyclically replace capital letters. For example, the replacement rules ABa and BAb would recursively call one another without replacing the initial portion of the string by small letters.

•The routine is fairly slow and may not function in realtime applications, where short time intervals (i.e., seconds) are important. For example, it would probably not be possible to generate strings of musical notes and play them simultaneously with the result sounding anything like music. Where time is critical, the strings must first be generated and stored in a mass storage medium, such as floppy disk, tape, or programmable memory. They may then be recalled when needed.

•The routine cannot easily generate all useful strings. Some transformations of existing strings cannot be produced by this routine. For example, when a musical phrase an octave higher or lower than an existing phrase is desired, it may not be easily produced using this system.

The inspiration for the routine came from the discussion of formal systems by Douglas Hofstadter (in Gödel, Escher, Bach: an Eternal Golden Braid, Basic Books, New York, 1979) and the formal theory of grammar (see Automata Theory: Machines and Languages by Richard Y. Kain, McGraw-Hill, New York, 1972). In these systems, a given string is expanded by the use of production rules to generate an axiom (discussed by Hofstadter) or an element of the language (discussed by Kain). The major difference between these systems and the present one is that, in the former cases, each capital letter may have a number of different replacement strings so that any number of possible expansions are possible, defining either a formal system or formal language. In the case of the above routine (where only one possible expansion is allowed for any capital letter), the initial string will always produce the same expanded string.



# We Have It!



Integrated Desk Top Computer with 12 inch Bit-Mapped Graphics or Character Display, 64Kb RAM, 4 MHz Z80A, Two Quad Capacity Floppy Disk Drives, Selectric Style 87 Key Keyboard, Business Graphics Software

# NorthStar M

#### The New ADVANTAGE

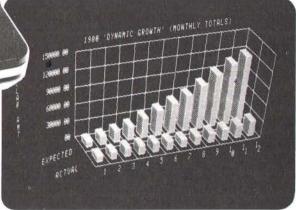
w/ graphics running in seperate 20K of RAM; also includes 2K Boot Strap ROM.

Optional operating systems.

G/DOS runs existing NorthStar programs; Graphics C/PM® also runs conventional NorthStar C/PM® programs. Serial ports and parallel ports are available as options.

Call for prices.

Typical Systems Graphics:



3-DIMENSIONAL CHART

#### **MULTI-USER HORIZON SYSTEMS**

Low Cost, Packaged, High Performance, Multiuser HORIZON® systems with 5Mb or 18Mb Integrated Winchester Hard Disks, Up to Five Users.

HRZ-IQ-64K-HD5

w/5 Megabyte Winchester ..... \$4749\*

Four-User HORIZON 1Q-64K-18H w/ 18Mg Hard Disk. only \$8260

\* To May 30, 1982

317

**Optional Operating Systems.** 

Multi-user operating systems now available to run both NorthStar DOS/BASIC and standard C/PM<sup>9</sup>programs (offers more available RAM than an MP/M system)



H RAM 64K Memory Board, \$595

\* To May 30, 1982

All prices, F.O.B. shipping point, subject to change. All offers subject to withdrawl without notice. Advertised prices reflect a 2% cash discount (order prepaid prior to shipment), C.O.D.'s and credit card orders are 2% higher.



# MiniMicroMart, Inc.

943 W. Genesee St. P.O. Box 2991B Syracuse, N.Y. 13220 (315) 422-4467 TWX 710-542-0431

Circle 288 on inquiry card.

# TRS-80 BASIC Program Hang-ups

### The Reasons and Some Solutions

Understand and eliminate those mysterious crashes

Glenn Tesler POB 83 North Hollywood, CA 91603

Have your TRS-80 BASIC programs ever stopped for no apparent reason or hung up in the middle of an operation? There are at least six reasons why this can happen:

- 1. The program is trying to output to a nonexistent printer or to one that's not ready.
- String space collection, also known as garbage collection, is taking place.
- Your program is large and has many line references to the middle or end.
- 4. Your program uses variables that were not defined in the *proper* order (the proper order will be explained later).
- 5. Your program is stuck in an endless loop.
- 6. Your system has crashed, your memory has dropped out, etc.

These problems occur often, and can be annoying, especially when you have to load the program again and start over. Here are some solutions to the first four possibilities, some of which should improve your program execution time.

#### Printer Not Ready

Occasionally, you may run a program that contains LPRINT (output to printer) statements when your printer is off or disconnected. If so,

your program will hang up when it reaches the first LPRINT, because the TRS-80 printer-driver software waits until the printer sends a ready signal before it transmits each character to be output. If the printer is off, this software routine never receives the ready signal, staying in a loop without sending a warning message to the

# Often a TRS-80 BASIC program will stop during an operation for no apparent reason.

user. To prevent this, you need a routine that checks for the printer's presence without getting stuck. Listing 1 shows two methods, using both BASIC and Z80 machine language, that will alert you to the printer-not-ready situation.

If you use the NEWDOS operating system, accidentally pressing the J, K, and L keys simultaneously (the NEWDOS screen-print command) will result in a hang-up for the same reasons. To prevent this, you can disable the screen print by POKEing the decimal number 201 (hexadecimal C9) into decimal location 17333 (hexadecimal 43B5). To re-enable this function, you must POKE the decimal number 103 (hexadecimal 67) into the same location.

#### Garbage Collection

If you define 20 strings as 3 characters in length and then you redefine those same 20 strings as 2 characters, it should take up 40 bytes, right? Wrong! It takes 100 bytes: 60 for the old strings—now garbage—and 40 for the new strings. Eventually, the computer has to get rid of the garbage to free string space. This procedure sometimes seems to take forever.

The program in listing 2 repeatedly picks a random number from five to nine and defines 100 strings to that length; the random numbers are displayed between the asterisks. The program also shows how much string space is left in memory. Occasionally, this program pauses when the numbers get low. This means that it is time for string space compression, also known as garbage collection, which the computer usually does without a warning. This doesn't have to happen anymore!

Save the BASIC program from listing 2, then decide whether you want to use BASIC or machine language to create a string-compression detector. If you select BASIC, enter the program in listing 3; use the program in listing 4 if you select machine language.

The BASIC version POKEs a machine-language program similar to that in listing 4 into memory. Before running the BASIC version, you must

# THE DAWN OF A NEW ERA "THE COMPUTER-LINE"

VISTAO NH X HAWLETT. PACKARD

**APPLE** 

**EPSON** 

NEC

Our Volume Sales Are So High That Our Prices Are The World's Lowest - Period!

CALIFORNIA COMPUTER SYSTEM	s	MOUNTAIN HARDWARE		
7710 Async. Serial Int.	\$135	CPA Multi-Function Card	\$169	
7490 GPIB (IEEE-488) Int.	\$239	The Clock	\$229	
7470 Ana. to Dig. Converter	\$ 99	Supertalker	\$159	
7711 Async. Serial (Term)	\$135	Music System	\$319	
7712 Sync. Serial Int.	\$149	Expansion Chassis	\$599	
7721 Apple Parallel Int.	\$109	Romwriter	\$139	
Calendar/Clock Module	\$ 99	Ram Plus (32K Board)	\$149	
Programable Timer	\$ 99			

	PRINT	ERS	
NEC		ANADEX	
Spinwriter 7710	\$ 2339	DP9500/9501	\$ 1275
8023 A	\$CALL	INTEGRAL DATA SYSTI	EMS
EPSON		Prism 80	\$ 1195
MX 80	\$CALL	Prism 132 Color Printer	\$ 1595
MX 80 Ft.	\$CALL	MPI	
MX 100	\$CALL	88 G Printer	\$ 659
		99 G Printer	\$ 749
	BUSINESS S	OFTWARE	
VISICORP, INC.		STONEWARE	
Desktop Plan III	\$229	DB Master	\$169
Desktop Plan II	\$189	DB Utility Pack	\$ 69
Visifiles	\$189	MICRO PRO	
Visiplot	\$159	Apple CP/M	
Visitrend/Visiplot	\$229	Word Star	\$219
Visidex	\$189	Super Sort	\$119
Visiterm	\$ 79	Mail Merger	\$ 79
Visicalc 3-3	\$189	Data Star	\$179
Visipak	\$539	Spell Star	\$119
A CONTRACTOR		Call Star	\$119
	INFORMATION U	INLIMITED	
	Pro Easy Writer	\$169	

Call For Continental, Dakin 5, Broderbund, Automated Simulations, Avant-Garde, Edu-Ware, Denver, Howard, Sirius, Sensible, Synergistic Software, Etc.

MBI™
COMPARE!

DRIVES FOR

WITH
CONTROLLER
\$459
ADD-ON \$389

Hard Disks + 8" Disks for Apple, TRS-80 \$CALL
Apple Computer Products \$CALL



# PRODUCTS • PLEASE CALL OR WRITE FOR CATALOG.

MODEMS		DISKETTES (Boxes	of 1	0)
Hayes Micromodem II	\$289	Verbatim Datalife		24-95
Hayes Smartmodem	\$229	Verbatim 8"		
Hayes Chronograph	\$199	Double-Side/DD	\$3	9-95
Novation Cat	\$145	RAM CARDS		
Novation D-Cat Modem	\$165	Ramex 16 K Card	\$	119
Novation Apple Cat II	\$339	Ramex 128 K Card	\$0	CALL
Novation Auto Cat	\$209	Wesper 16 K Card	\$	119
		Microsoft 16 K Card	\$	139
		Dana 16 K Card	\$	119
MONITORS		80 COLUMN CA	100000	
Zenith ZVM-121 Phospho	or	FOR APPLE		(Approximate)

			rates to see a
MONITORS		80 COLUMN CAR	DS
Zenith ZVM-121 Phosphor		FOR APPLE	
15 MHZ	\$119	Wesper 80 Card	\$259
NEC 1201 Phosphor		Vision 80 Card (Vista)	\$299
20 MHZ	\$179	Videx 80 Card	\$259
NEC 0112 Composite		MISCELLANEOU	S
Color	\$335	APPLE PRODUCT	rs
NEC 2112 RGB Color	\$899	Enhancer II	\$ 119
Amdek 300 Phosphor	\$199	Dana Apple Fan	\$ 39
Amdek Composite Color	\$355	Sup R Mod	\$27-95
Amdek IBM Compatible			
Color	\$899		

IN COLORADO (303) 279-2727

CALL "THE COMPUTER-LINE"™ 7 DAYS

1-(800)-525-7877

COMPUTERWORLD INTERNATIONAL, INC.

SUITE 133, P.O. BOX 81, WHEAT RIDGE, COLORADO, U.S.A. 80034-0081

IN COLORADO SUITE 108 THE GOLD OFFICES 607 10TH ST. GOLDEN, CO 80401

TERMS: RETAIL/MAIL ORDER: MASTERCHARGE/VISA ACCEPTED. WE CALCULATE UPS FREIGHT.



**Listing 1:** Two methods of alerting a user to a printer-not-ready condition on a TRS-80 Model I. Listing 1a is a one-line BASIC statement that prints a warning message if the printer is absent. Listing 1b is the machine-language equivalent (users must write their own code to display the warning).

1a

IF (PEEK(14312) AND 240)<>48 THEN PRINT"PRINTER IS NOT READY"

1b

LOOP	CALL	5D1H	;IS PRINTER READY?
	JR	Z,PRTRDY	; YES, START PRINTING
	CALL	PRTMSG	;DISPLAY WARNING (CODE NOT SHOWN)
	CALL	49H	; WAIT TILL KEY PRESSED
	JR	LOOP	; SO WE CAN TEST AGAIN
PRTRDY	EQU	\$	;PRINTER IS READY

set the TRS-80 memory size to at least 71 bytes below the actual end of memory (or at least 65 bytes below where you usually set it if you have other programs in high memory). When you run it, the program will ask where in memory you want the machine-language program to be

POKEd. Answering with an ENTER will tell the program to use the current memory size. An address below the memory size will result in an error; otherwise, the program will POKE the data to the location specified.

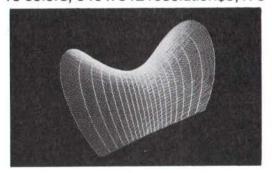
To use the machine-language ver-

sion, first assemble the source code given in listing 4 using a TRS-80 assembler. If you are using a tape-based system (Level II), save the object (executable) code to tape with the name CKSTR. Then reset the memory size as described above, ready the tape for loading, go into the system mode, type in "CKSTR," and hit ENTER to begin loading. When the tape is loaded, type "/" and ENTER. This will run the CKSTR program and return to BASIC. On a disk-based system, save the object code to disk with the name CKSTR. Type in this file name when you are in DOS (disk operating system). It will load, initialize, and return to DOS. You should then enter BASIC, setting your memory size as explained above.

Once you have a version of CKSTR in memory, load and run the program in listing 2 again. When it is time for a string compression to occur, the CKSTR routine displays a graphic character that looks like the letter C (for compression) in the

## S-100 HIGH RESOLUTION GRAPHICS

16 colors, 640 x 512 resolution\$3,175\*



High speed: up to 500,000 dots per second with 8 bit processor, even faster with 16 bit processor

Lightpen option

Bit plane write protect option for overlays Gray levels and monochrome systems Full user's guide, separate Service Guide Compatible printers and monitors

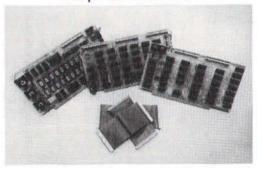
\*includes hardware, basic software package, 160 K bytes of graphics memory



#### CAMBRIDGE DEVELOPMENT LABORATORY

36 Pleasant St., Watertown, MA 02172 (617) 926-0869

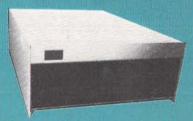
**Graphics Software** 



Program in BASIC, FORTRAN, PASCAL, or assembler
Programmable characters with 80 characters per line
Graphical BASIC interpreter with PEEK and POKE
Logo TURTLE graphics, relative coordinates Tektronix emulator
Cartesian plotting package
3-D perspective with rotation
Hidden line processing
Screen dump to matrix printer or pen plotter
Screen dump to disk and replay

Quality Computer Services presents..

# Hard Disk Systems





For TRS, Apple, Heath, S-100, IBM 6,12,20,40 and 80 Megabyte systems

Completely assembled and tested subsystem including:

- Switching power supply
- Winchester drive
  Host adapter card
  Sealed case
- Expansion

The encloser, controller and power supply have been designed to allow for future backup hardware or increased

- Auto attach CP/M\*
- Hard disk utilities

- Formatting program Assigns alternate sectors for any weak sectors detected during formatting assuring the lowest possible error rate
- . Warranty: The system has a full one year warranty on all parts and workmanship
- Also available: attach for TRSDOS, OASIS\*, Apple DOS
- Optional 5¼" floppy (shown)

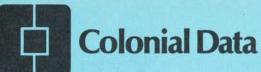
Real time clock

See local dealer or call: Quality Computer Services 178 Main Street Metuchen, New Jersey 201-548-2135

Quantity discounts available. Distributor, Dealer and OEM inquries invited.

Toll free number: 800 631 5944

OASIS is a trademark of Phase One Systems, CP/M is trademark of Digital Research



# Introduces the SB-80/4



The SB-80/4 computer has the hardware features needed for today's sophisticated small business systems that demand speed and storage capacity for a single user or the multiuser application that demands up to four users.

......

- 5 separate 4 MHZ Z80A CPU's Interface
- 320K 200ns Main Memory
- 8 or 5 1/4 Inch Dual **Density Floppy Drives**
- CP/M Compatible **Operating System**
- 4 Parallel Ports (Master Board)
- 6 Serial Ports (2 Master Board - 4 Slave Board)
- Winchester Hard Disk
- Four Channel DMA Controller
- 50 Pin Expansion Connector
- Real Time Clock

#### SINGLE BOARD TECHNOLOGY

By utilizing the latest in Large Scale Integration, engineers have packaged into a single board a complete computer system with features found only in other costly multi-board systems. Each user has a dedicated Z80A microcomputer module with dedicated 64K RAM housed in the system mainframe.

Any computer is only as good as its software, and the combination of a Z80A CPU and CP/M allows access

to the largest library of software available for eight-bit micros. BASIC, FORTRAN, Pascal, COBOL, APL, and PL/I languages are available now. Complete integrated business and engineering systems are ready to run. In addition, our multi user I/O supervisory operating system allows up to four users to simultaneously perform computer functions or share the same database on the SB-80/4.

#### LARGE CAPACITY DISK

Eight-inch drives store three times as much data at twice the transfer speed of smaller drives. The SB-80/4 cabinet can house two single or double sided drives, and two more drives can be attached. That's up to four megabytes of floppy disk storage. For extended applications, hard disks and multi SB-80/4 networks are available.

#### WINCHESTER HARD DISK

Hard disk options from 10 megabytes up to 104 megabytes are available for applications requiring large database files and records.

#### AFFORDABLE

The result is a high-speed, full featured microcomputer system at a price that beats the competition. The SB-80/4 gives you minicomputer performance and capacity at microcomputer size and price.



#### Colonial Data Services Corp.

105 Sanford Street Hamden, Conn. 06514

(203) 288-2524 • Telex: 956014

Mid Atlantic Distributor
COMPUTER APPLIED SYSTEMS, INC.

497 Hill Street. York. Pennsylvania 17403 • (717) 848-2431

\* CP/M is a registered trademark of Digital Research, Inc.

New England Distributor S&M SYSTEMS, INC.

P O. Box 1225 • 2 Washington St., Haverhill, MA 01830 • (617) 373-1599

Circle 453 on inquiry card.

**Listing 2:** This BASIC program will show the delays caused by TRS-80 string compression and how these delays are caused by the way string space is maintained.

```
100 'STRING
                  (c) COPYRIGHT 1980 by Glenn Tesler
110
120
    'THIS PROGRAM SHOWS THE DELAYS CAUSED BY STRING
130 'COMPRESSION, AND ALSO HOW THESE DELAYS ARE CAUSED
140 'BY THE WAY STRING SPACE IS MAINTAINED.
150
160
       GOTO 560
                                         'GO DO INITIALIZATION
170
180
       A = RND(5) + 4
                                         'PICK A RANDOM LENGTH
190
                                         'FROM 5-9.
200 '
       PRINT : PRINT "*"; A; "*"
210
                                         'DISPLAY IT BETWEEN
220
                                         'ASTERISKS
230 '
240 'NOW DEFINE EACH ELEMENT IN THE ARRAY TO THE RANDOM LENGTH
250
    'WHICH WAS JUST PICKED. THEN, DISPLAY THE AMOUNT OF
    'STRING SPACE LEFT TO ALLOCATE TO STRINGS BEFORE GOING
260
270
    'THROUGH THE STRING COMPRESSION ROUTINE. FRE (A$) IS NOT
280 'USED SINCE IT INVOKES THE STRING COMPRESSION ROUTINE,
290
    'AND THAT WOULD DEFEAT THE PURPOSE OF THIS EXAMPLE.
300
       FOR B=1 TO X/10
310
                                         'ARRAY ELEMENT COUNTER
320
         AS(B) = STRINGS(A, 32)
                                        'DEFINE AN ELEMENT
330
                                        'TO THE RANDOM LENGTH
340
         X1=PEEK(16598) + 256*PEEK(16599) 'STRING WK AREA PTR
350
         X2=PEEK(16544) + 256*PEEK(16545) 'START OF STRING DATA
                                         POINTER
360
370
         PRINT X1-X2;
                                        'CALCULATE & DISPLAY
                                        'THE AMOUNT OF FREE
380
390
                                        'STRING SPACE
                                        'LOOP TILL EACH ELEMENT
400
         NEXT B
                                        'HAS BEEN DEFINED
410
       GOTO 180
                                        'PICK A NEW RANDOM
42U
                                        'LENGTH
430
440
450
          END
                  OF
                        MAIN
                                   PROGRAM
460
470
   'INITIALIZATION
480
490
500
    'ALLOCATE STRING SPACE. WHEN THE ARRAYS ARE DEFINED, THE
    'AMOUNT OF STRING SPACE ALLOCATED BY THE CLEAR/10 WILL BE
510
520 'THE NUMBER OF ARRAY ELEMENTS IN ALL. THIS WAY, YOU CAN
    'CAUSE MORE STRINGS OR LESS STRINGS TO BE DEFINED TO
530
    'RANDOM LENTHS. CURRENTLY, THERE ARE 100 STRINGS IN ALL.
540
550
560
       CLEAR 1000
                                         'CLEAR SCREEN
570
       CLS
                                        'USE INTEGERS FOR SPEED
580
       DEFINT A-W, Y-Z
590
    'PRE-DEFINE VARIABLES FOR SPEED
600
       A=0 : B=A : X1=0 : X2=0
610
620
630
    'GET AVAILIBLE STRING SPACE. FRE IS BEING USED AS THERE
640
    'HAVE BEEN NO STRINGS DEFINED ALREADY, THUS NO GAPS
    'HAVE BEEN CREATED.
650
660
670
       X=FRE (A$)
680
690 'NOW SET UP AN ARRAY.
700
710
       DIM A$ (X/1U)
720
       GOTO 180
```

**Listing 3:** This BASIC program tells the user if any string compression or garbage collection is occurring by displaying a graphics character in the upper right-hand corner of the screen.

```
1000 'ROUTINE TO POKE "STRING COMPRESSION DETECTOR" INTO MEMORY 1020 ' (c) COPYRIGHT 1980 by Glenn Tesler 1040 ' GOTO 4120 'GO DO INITIALIZATION Listing 3 continued on page 324
```

upper right-hand corner of the screen. When the garbage collection is finished, the character is removed. With this routine in memory, you will never have to wonder if the computer has crashed or is merely collecting garbage.

The garbage collection routine (starting at hexadecimal location 28E6) uses the Z80 RST instruction. and my detection program takes advantage of this. An RST causes the processor to begin executing at a location in low memory; the garbage collector contains an RST 18, effectively the same as a subroutine call to location hexadecimal 18. Contained in this location, which is in ROM (read-only memory), is a jump vector to another location in programmable memory (hexadecimal 4006), which in turn points to the routine that is the target of programs calling this particular RST. By replacing the information in the second jump vector (locations 4006 to 4008 hexadecimal), any call to RST 18 must first go through my program, where it then checks to see if the call came from the compression routine. If so, the graphics character is displayed, a "switch" in memory is set, and the program jumps to the original target of the RST 18; otherwise, it just does the RST 18.

To erase the graphics character when the compression routine is finished, RST 20 is also checked. This points to a routine that tests data type (i.e., string, integer, etc). Since almost every command has to check the data type, RST 20 is used a lot. When this RST is called, the program checks to see if the "switch" in memory is set and the graphics character is being displayed. If so, it resets the switch and erases the character, and continues with the regular RST 20.

The machine-language program is only 65 bytes long, including the initialization routine. If you are wondering whether an RST 20 is performed in the string-compression routine, it is not. Also, if you are wondering why I didn't use FRE(A\$) in the BASIC program, it is because it uses the string-compression routine before calculating the available string space.



### MICRO PRICE for MINI POWER MICRO-MINI™ matches Series I by IBM **DELIVERING CURRENT ORDERS**

You cannot buy a more powerful micro:

- Power: 1 to 32 independent users
- Memory: directly addresses to 16 Meg!
- Mapping: efficient memory management
- Disk: 2M to more than 250M
- Speed: throughput 10 times Z80
- Files: simultaneous access
- Communication: inter-user via terminals
- Security: all files password protected
- Options: expandable in the field
- Bus: Intel Multibus™ compatible
- Languages: Pascal, BASIC, COBOL, FORTRAN

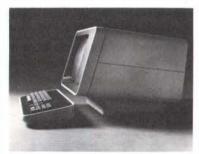
System 3

\$7053

This 16-bit Multibus™ computer system includes:

- Z8001 CPU and 256K RAM
- 8 serial I/O ports
- 15-slot backplane
- Dual floppy disk drives
- Multiuser Operating System Field upgrade to 16MB RAM, 268MB of hard disk, 32 users. Pascal, BASIC, C, COBOL and FORTRAN languages.

Call for further system specifications.



### AMPEX Dialogue 80™

Dialogue 80™ fully-featured video terminal:

- Full ASCII with numeric and edit keypads
- Elegant case with detachable keyboard
- Display 24 lines with 25th status line
- 20 user programmable function keys
- 2 pages display memory (4 optional)
- 11 graphics and 21 control codes
- 10 modes including block, protect, program

Transparent mode displays control codes

Dialogue 80™ .....\$1045 Dialogue 80™ with phone coupler......1194

Applications: word processing, data entry, interactive programming, data base inquiry/response/ update, transaction processing, whether on-site or remote. For our system or for yours, this interactive terminal is the perfect match.

Prices: Prepaid or Purchase Order Net 10. Prices subject to change without notice. Warranty: 120 day minimum on all systems. Interfacing cables free with all systems. 10% down fixes price, guarantees priority. MasterCard and VISA cards accepted.



Listing 3 continued:

1100 'SET UP A DEFAULT LOAD ADDRESS AT WHICH TO POKE DETECTOR, 1120 'THEN LET USER OVERRIDE IT IF NECESSARY 1140 ' 1160 'DEFAULT LOAD ADDRESS M1 = M'BEGIN WITH FRESH SCREEN 1180 CLS 1200 PRINT "WHERE SHOULD THE STRING COMPRESSION DETECTOR" PRINT " 1220 (DEFAULT IS: "; M1; ")"; BE LOADED INPUT M1 1240 1260 IF M1 >= M THEN 1460 'LOAD POINT MUST BE >= MEM SIZE 1280 PRINT 1300 PRINT "MEMORY SIZE IS SET AT"; M; 'ERROR MESSAGE PRINT "SO RESET MEMORY SIZE AND TRY AGAIN" 1320 1340 'DON'T LET PROGRAM CONTINUE END : GOTO 1300 1360 1380 'SAVE FINAL LOAD ADDRESS, THEN CONVERT IT TO VALUE 1400 'FOR THE "POKES": 0-32767 REMAIN THE SAME, BUT 1420 '65536 MUST BE SUBTRACTED FROM 32768-65535. 1440 1460 ""M" IS LOAD ADDRESS FOR PGM. M=M11480 IF M > 32767 THEN A=M-65536 ELSE A=M 1500 1520 'POKE THE MACHINE LANGUAGE PROGRAM INTO HIGH MEMORY. 1540 'ANOTHER ROUTINE WILL HANDLE THE RELOCATION AS NEEDED. 1560 1580 PRINT : PRINT "NOW POKING PROGRAM INTO HIGH MEMORY..." 1600 FOR B=1 TO NB 'LOOP TO DO THE POKES 'ONE BYTE AT A TIME 1620 READ C POKE A,C 1640 'INTO HIGH MEMORY 1660 IF A=32767 THEN A=-32768 ELSE A=A+1 'CHECK BOUNDARY 'TO KEEP 'A' A VALID INTEGER 1680 NEXT B 1700 1720 'INTEGERS MUST BE IN THE RANGE: -32768 TO 32767 1740 'IF "M" EXCEEDS 32767, IT WOULD BE AN ERROR. 1760 'SUBTRACTING 65536 FROM "M", A NEGATIVE NUMBER RESULTS, 1780 'WHICH ACTUALLY IS A Z-80 ADDRESS BETWEEN 32768 AND 65535 1800 ' 1820 IF M > 32767 THEN M=M-65536 'CHECK AND ADJUST RANGE 1840 'MACHINE LANGUAGE IS NOT SELF-RELOCATABLE, 1860 1880 'SO NOW IT IS NECESSARY TO CALCULATE AND ADJUST SOME 1900 'OF THE ADDRESSES IN IT. 1920 1940 'THE CALCULATION IS DONE THIS WAY: 1. CALCULATE ABSOLUTE ADDRESS OF A VARIABLE 1960 ' 1980 WITHIN THE MACHINE LANGUAGE PROGRAM: 2000 ' MO = PROGRAM LOAD ADDRESS + VARIABLE DISPLACEMENT 2020 ' WITHIN PROGRAM 2040 ' 2. CONVERT ADDRESS 'M1' TO TWO SINGLE BYTES: LSB, MSB: 2060 ' M2 = LSB, M1 = MSB2080 ' 3. CALCULATE WHERE TO STORE ADJUSTED VARIABLE ADDRESS AND STORE IT THERE. THIS MAY HAVE TO BE DONE MORE THAN ONCE IF THE VARIABLE IS REFERENCED MORE THAN 2100 2120 ' 2140 ' ONCE. 2160 ' 2180 PRINT : PRINT "NOW RELOCATING INTERNAL ADDRESSES..." 2200 'ADDRESS OF GRAPHIC DISPLAY RTN M0 = M + 13'EXTRACT LSB FROM 2-BYTE ADDR. 2220 M2=M0 AND 255 2240 M1=INT(M0/256) AND 255 'EXTRACT MSB ALSO 2260 POKE M+1, M2 'STORE LSB INTO MACH LANG PGM 2280 'STORE MSB POKE M+2, M1 2300 ' 2320 'ADDRESS OF "GRAPHIC REMOVER" M0 = M + 38'CALC LSB OF GRAPHIC REMOVER 2340 M2=M0 AND 255 2360 M1=INT(M0/256) AND 255 'CALC MSB 'STORE THEM INTO PROGRAM 2380 POKE M+7, M2 2400 POKE M+8, M1 2420 ' 2440 M0 = M + 64'ADDRESS OF A SWITCH IN PGM 2460 M2=M0 AND 255 'LSB OF SWITCH ADDRESS 'MSB 2480 M1=INT(M0/256) AND 255 POKE M+33, M2 2500 'STORE SWITCH ADDRESS INTO POKE M+34, M1 POKE M+39, M2 2520 'PROGRAM IN THREE LOCATIONS. 2540 'IN THREE PLACES 2560 POKE M+40, M1 2580 POKE M+47, M2 2600 POKE M+48, M1 Listing 3 continued on page 326

There's great business ahead!

And here is THE DATA BASE to get you there.

Meet GBS...the most complete, most powerful relational database management system available. It was designed to go beyond the capabilities of ordinary DBM systems. And it does. Where others may possibly be stateof-the-art...GBS, our General Business System, is ahead-of-the-art!

ecause it is relational, GBS is far more valuable to you and your business. It has the capability to access an almost unlimited amount of data from a variety of files, then combine that data and display or print it in a format that you specify.

### Relational, Efficient & Automatic

GBS can automatically search for, locate, and interrelate information from many files. For example, on each order entry it can automatically decrement inventory; automatically post the data to your Accounts Receivable and automatically update your General Ledger. You don't have to spend countless hours making redundant entires, with the chance for numerous errors. GBS' inter-file relationships and adjustments save you considerable time. and thus many hours of high-cost labor.

Most other business programs are limited single file systems, whereas GBS allows you to work with 3 different files at the same time. All Indexes are updated automatically. What's more, a large GBS data file can extend over 4 different disk drives...not merely one. No other data base system has the power and flexibility of GBS!

### A program generator, par excellence

Included as a part of GBS is a very powerful applications development tool, called QUICK GEN. Basically, this function allows almost anyone -- even those unsophisticated about computers to generate useful business programs. Think of the efficiency you gain when anyone on your staff can quickly generate a needed program to solve a particular problem! But, GBS versatility doesn't stop there. GBS is also ...

### ...a Fully Programmable system...

... which allows you, or those with deeper computer interest, to create almost any business application program, such as accounts payable/receivable ... payroll ... general ledger ... order entry ... mailing lists ... personnel files ... cost accounting ... real estate listings ... time/expense management, and many more. And each one will be a personalized program ... individualized to the specific requirements of your firm!

### Start using GBS now

You can. Because GBS is up and running on most popular CP/M\* based computers, like those made by Apple, Tandy, Xerox, Sharp, NEC, Hewlett Packard, Toshiba, Osborne, Televideo, Vector, Altos and more.

You can. Because GBS documentation is written in a friendly, freeflowing, style...and it leads you by the hand with plenty of tutorials and easily understandable examples. And, the entire documentation is typeset for ease of

You can. Because GBS is fully supported by QUALITY SOFTWARE. So, if you ever have a question, or need assistance, simply contact QUALITY SOFTWARE and our professional support people will be happy to help.

Because we offer a You can. special 30-Day Money Back Guarantee. Order your edition of GBS at \$700 (on disk, with complete professional documentation) and try GBS in your own business environment. If GBS isn't all we say it is, and more, simply return it within 30 days for a full refund. This offer is for a limited time only, so please act immediately.

### Call Today

There's great business ahead. And GBS is the relational data base management system which can help you control your information and data quickly, efficiently and effectively. Call us today for additional information or to

take advantage of our special 30-Day Money Back Guarantee.

GBS - it's the best business decision you can make, for today and the future.





QUALITY SOFTWARE

6660 Reseda Blvd., Suite 107 Reseda, CA 91335 (213) 344-6599

\*CP/M is a registered trademark of Digital Research.

Oncie 30 on inquity card.



### NEC PC-8023A-C Printer \$49988 DELIVERED

- ☐ 100 cps bi-directional printing
- ☐ Adjustable tractor/friction feed
- ☐ Proportional spacing
- ☐ Hi-res dot-addressable graphics
- ☐ True descenders in 5 fonts
- ☐ Subscript, Superscript & underlining

### Okidata Printers

MICROLINE 80	
MICROLINE 82A \$47988	
MICROLINE 83A	
MICROLINE 84 (Parallel) \$105988	
MICROLINE 84 (Serial) \$119488	
OKIGRAPH ROM—adds Hi-Res capabilities	
to 82A and 83A Printers \$8988	

### **IDS Printers**

PRISM 132	(Color)	 \$169988
PRISM 80 .		 . \$98988

### **Epson Printers**

MX-80 w/GRAFTRAX	\$4748
MX-80/F-T	\$5698
MX-80/F-T w/GRAFTRAX	\$6198
MX-100	\$7198
GRAFTRAX	\$898

### Centronics Printers

CENTRONICS 739 (Parallel)	\$53988
CENTRONICS 739 (RS-232-C)	
2-Color Adapter	

### C.Itoh Printers

988
988

Cables and interfaces available for the APPLE, ATARI, CBM/PET, IBM, OSBORNE, and TRS-80.

### Orders & Information: CALL (603)-673-8857

Orders Only: CALL (800)-343-0726

We accept CODs—No surcharge for credit cards No charge for UPS shipping—Stock shipments next day—All equipment shipped factory fresh with the manufacturer's warranty

Prices subject to change

HIGH TECHNOLOGY AT AFFORDABLE PRICES

### THE BOTTOM

4100 '

12 Johnson Street, Milford NH 03055-0423

```
Listing 3 continued:
2620 '
2640 'NECESSARY RELOCATIONS ARE COMPLETE.
2660
     'SET UP THE "USR" CALL: ASSUME LEVEL II, BUT IF IN
2680
     'DISK BASIC, SET IT UP THROUGH A "DEFUSR":
2700
2720
2740
        POKE 16526, M AND 255
                                         'LSB OF DETECTOR START
2760
        POKE 16527, (M/256) AND 255
                                         'MSB
2780
     'NOW SEE IF IN DISK BASIC.
2800
                                 IF SO, ABOVE DIDN'T HURT.
2820
        IF PEEK (16809) <> 201 THEN DEFUSR=M
2840
     'NOW ACTIVATE THE STRING COMPRESSION ROUTINE.
2860
     'IT WILL REMAIN IN HIGH MEMORY UNTIL YOU RE-BOOT OR
2880
     'RE-INITIALIZE BASIC. YOU CAN LOAD AND RUN OTHER
     'BASIC PROGRAMS NOW, AS LONG AS THEY DO NOT POKE OTHER
2920
     'MACHINE LANGUAGE PROGRAMS INTO THE SAME PLACE AS THE
2940
2960
     'STRING COMPRESSION ROUTINE.
2980
3000
        *** MAKE SURE YOUR OTHER PROGRAMS DO NOT ***
3020
                DESTROY THE DETECTOR !!!
3040
3060
        M=USR(0)
                                 'ACTIVATE THE DETECTOR
3080
3100
    'END OF MAINLINE OF PROGRAM
3120
3140
        PRINT : PRINT "STRING COMPRESSION DETECTOR ACTIVE"
3160
        END : GOTO 3160
                                  'MAKE SURE PROGRAM STOPS HERE
3180
3200
                END
                        OF
                               MAIN
                                         PROGRAM
3220
3240
3260
     'ERROR ROUTINE FOR HANDLING OVERFLOWS IN A CERTAIN BLOCK
3280
     'OF LINES. IF THE ERROR IS SOMEPLACE ELSE, OR IS NOT
3300
     'AN OVERFLOW, THEN BASIC'S NORMAL ERROR MESSAGE IS GIVEN.
3320
     'IF IT IS AN OVERFLOW IN THAT BLOCK, THEN THIS ROUTINE
     'MODIFIES THE APPROPRIATE VARIABLE.
3340
3360
3380
     'CHECK TO SEE IF VALID ERROR
3400
3420
       IF ERR<>10 OR ERL<2200 OR ERL>2820 THEN ON ERROR GOTO 0
3440
     'IF ERROR OCCURED WITH MO, CHANGE MO ELSE CHANGE M
3460
3480
3500
       IF ERL=2200 OR ERL=2220 OR ERL=2240 THEN 3700
3520
       IF ERL=2320 OR ERL=2340 OR ERL=2360 THEN 3700
3540
       IF ERL=2440 OR ERL=2460 OR ERL=2480 THEN 3700
3560
3580
     'IN THE NEXT TWO LINES: IF THE VARIABLE IS NEGATIVE,
3600
     '65536 IS ADDED. IF POSITIVE, 65536 IS SUBTRACTED. THIS
3620
     'SHOULD TAKE CARE OF THE OVERFLOW. NEXT IT RESUMES TO
3640
     'GIVE CONTROL BACK TO THE ERROR LINE.
3660
3680
       M=M+(-SGN(M)*65536) : RESUME
3700
       M0=M0+(-SGN(M0)*65536) : RESUME
3720
3740
                        OF
                              ERROR
                                           ROUTINE
3760
3780
3800
     'THESE DATA STATEMENTS CONTAIN THE MACHINE LANGUAGE
3820
     'PROGRAM THAT IS THE "STRING COMPRESSION DETECTOR"
3840
                          34,
3860 DATA
           33, 181, 255,
                                 7,
                                     64,
                                          33, 206, 255,
           10,
3880 DATA
               64, 201, 227, 213,
                                    17, 253,
                                               40, 205, 144
                          32,
                               10,
           28, 209, 227,
                                               50,
3900 DATA
                                    62, 183,
           62,
                 1,
                     50, 232, 255, 195, 144,
                                               28,
3920 DATA
                                                    58, 232
                               16, 175,
3940 DATA 255, 203,
                     71,
                          40,
                                          50, 232, 255,
3960 DATA
                60, 254, 183,
                               32,
                                                         63
           63,
                                      5,
                                          62,
                                               32,
                                                    50.
3980 DATA
           60, 195, 217,
                          37,
4000
4020
                        OF
                END
                              DATA
                                        STATEMENTS
4060
4080 'INITIALIZATION
```

### 8086-SUPER MICRO.



### Superfast in its class and ready to run.

Computer Benchmarks—All systems running the same BASIC program.

Class	Operating System	Language (Type*)	Run Time (Seconds)
Mainframe	VS2-10RVYL	Stanford BASIC	10
Micro	MS-DOS		33
Mini	n/a	BASIC (I)	45
Mainframe	PRIMOS	BASIC V16.4 (I)	63
Mainframe	TOPS-10	BASIC (I)	65
Mainframe	Release 05		129
Micro			178
Mini			250
Micro	MS-DOS	Microsoft BASIC (I)	310
Micro	AMOS 4.3a		317
Mini	n/a	BASIC (I)	330
Mini	Time Share	BASIC 5.32	517
Micro	OS65D 3.2		680
Micro	NSDOS	NorthStar BASIC (I)	685
Micro	TRSDOS 1.2	BASIC (I)	792
Micro	DOS 3.2	Applesoft II (I)	960
Micro	CDOS	32K BASIC (I)	1074
Micro	n/a	Microsoft BASIC (I)	1374
Micro	n/a	BASIC (I)	1951
Micro	n/a	Micropolis BASIC (I)	2251
	Mainframe Micro Mini Mainframe Mainframe Mainframe Micro Mini Micro Micro Mini Micro Micro Mini Micro	Mainframe WS2-10RVYL Micro MS-DOS Mini n/a Mainframe PRIMOS Mainframe TOPS-10 Mainframe Release 05 Micro MAGIC 1.0 Mini Time Share Micro MS-DOS Micro AMOS 4.3a Mini n/a Mini Time Share Micro OS65D 3.2 Micro NSDOS Micro NSDOS Micro TRSDOS 1.2 Micro DOS 3.2 Micro DOS 3.2 Micro CDOS Micro n/a Micro n/a	Mainframe VS2-10RVYL Stanford BASIC Micro MS-DOS Mini n/a BASIC (I) Mainframe PRIMOS BASIC (I) Mainframe PRIMOS BASIC (I) Mainframe Release 05 BASIC (I) Micro MAGIC 1.0 Microsoft BASIC (C) Mini Time Share BASIC (I) Micro AMOS 4.3a Alpha BASIC (I) Micro AMOS 4.3a Alpha BASIC (SC) Mini Time Share BASIC (I) Micro AMOS 4.3a Alpha BASIC (SC) Mini N/a BASIC (I) Micro OS65D 3.2 Level 1 BASIC (I) Micro NSDOS NorthStar BASIC (I) Micro TRSDOS 1.2 BASIC (I) Micro DOS 3.2 Applesoft II (I) Micro DOS 3.2 Applesoft II (I) Micro CDOS Microsoft BASIC (I) Micro DOS 3.2 Applesoft II (I) Micro DOS 3.2 Applesoft II (I) Micro N/a Microsoft BASIC (I) Micro N/a BASIC (I)

\*C = Compiler; I = Interpreter. Times (except for Seattle Computer) taken from August 1981 issue of Interface Age.

The Seattle Computer System 2 is the fastest micro on the block. In fact, System 2 outperforms many minis and mainframes.

Even the big boys such as: IBM System 34, Prime 550, and Hewlett-Packard HP 3000 are left in the dust when System 2 starts running.

The speedy System 2 consists of 8 Mhz. 8086 CPU set, 128K of 85 nsec. static RAM, double-density disk controller, 22-slot constant voltage mainframe, a cable for two 8" drives, and MS-DOS operating system (also called 86-DOS, IBM PC-DOS, Lifeboat SB-86).

High-level languages like Microsoft's Basic, Pascal, Fortran, Cobol are available now for your application programs.

System 2 comes fully assembled, tested and ready to run with the addition of disk drives (that we can supply) and terminal.

Call (206) 575-1830 for the location of your nearest System 2 dealer.

Dealer inquiries welcome.



1114 Industry Drive, Seattle, Washington 98188

Circle 374 on inquiry card.

### Listing 3 continued:

4120	DEFINT A-L, N-Z 'USE INTEGER VARIABLES	
4140	M=PEEK(16561)+256*PEEK(16562)+1 'MEM SIZE	
4160	ON ERROR GOTO 3420 'OVERFLOW ERROR HANDLER	
4180	C=0:B=C:A=C:M1=C:M2=C 'SET UP VARIABLES FOR SPEED	į.
4200	ON ERROR GOTO 3420 TAKE CARE OF OVERFLOW	
4220	C=0:B=C:A=C:M0=C 'SET UP VARIABLES FOR SPEED	1
4240	M1=C:M2=C	
4260	NB=65 'LENGTH OF MACH. LANG. PGM.	
4280	GOTO 1160 'GO BACK TO MAIN PROGRAM	
4300 '		
4320 '	END OF INITIALIZATION	

### Line Searches

When the TRS-80 BASIC interpreter encounters a GOSUB, GOTO, RUN, LIST, etc., it has to search for the associated line number. The interpreter always starts at the beginning of the program unless it is looking for a GOTO, RUN, or GOSUB, in which case it does one of the following:

- If the line referenced is earlier than the line the command is on, it will begin the search at the start of the program.
- If the line referenced is not earlier than the line the command is on, the search begins on the command line.
- If the command is entered as a direct statement, the search begins at the start of the program.

The further the line is from the command referencing it, the longer the interpreter takes to find it. This can take a long time in large programs. Here are three ways to prevent this situation:

- 1. Try to use subroutines as much as possible. This cuts down wasted program space.
- 2. Put frequently used routines near the start of the program to reduce search time.
- 3. Place your initialization routines at the end of the program, and start your program with a GOSUB to the routine. Then your program won't have to waste time going over lines that are used only once.

Also, when entering additional lines near the top of a large program, it takes a long time to get the prompt after hitting ENTER. Here are several reasons for this:

- The BASIC interpreter searches for the line, starting at the beginning of the program.
- If the line is currently in the program, it is deleted. When the interpreter deletes a line, the lines above must fill the empty space.
- •Next, the interpreter moves the lines that are past where the new one has to go to accommodate it.
- The line pointers for each line are changed, starting with the new line.
- The interpreter finishes up by executing a CLEAR.

### **Defining Variables**

Here are some recommendations on how to define variables. If you define them in these ways, the time it takes to find each variable should be reduced and the program execution time should improve.

- Use integer variables whenever possible.
- Define all variables in the statements of the program that will be executed first. These statements should be placed at the end of the program, and invoked by a GOSUB from the beginning of the program, as mentioned before. Then, it will not be necessary for BASIC to scan them when looking for GOTO and GOSUB targets during the rest of the run.
- Define simple variables before defining arrays.
- Define the most frequently used variables before defining infrequently used ones. (This is mentioned in the Level II manual on page 11/2.)

Combining these suggestions, you should define your frequently used variables before your seldomly used ones. Frequently used arrays should

### CALL YOUR LOCAL DYSAN OFFICE

St. Louis, Missouri (314) 434-4011

San Francisco, California Sunnyvale, California (408) 730-2145

Sherman Oaks, California (213) 907-1803

McLean, Virginia (703) 356-6441

Irvine, California (714) 851-9462

New York, New York (212) 687-7122

Schaumburg, Illinois (312) 882-8176

Fair Oaks, California (916) 966-8037

Glendora, New Jersey (609) 939-4762

Bellevue, Washington (206) 455-4725

Atlanta, Georgia (404) 952-0919

Arlington, Texas (817) 261-5312

Burlington, Massachusetts (617) 273-5955 (617) 229-2800 (OEM)

Rocky River, Ohio (216) 333-3725 (Cleveland) (412) 261-0406 (Pittsburgh)

Livonia, Michigan (313) 525-8240

Dysan Flexible Diskettes are also available from all ComputerLand Stores, Sears Business System Centers, and independent computer outlets nationwide.

For the location of the Dysan sales outlet nearest you, contact Dysan at: (408) 988-3472; Toll Free: (800) 538-8133; Telex 171551 DYSAN SNTA; TWX: 910-338-2144.

Circle 150 on inquiry card.

# DID YOU KNOW THAT THE BEST MEDIA AVAILABLE IS NOW AVAILABLE NEAR YOU?

Well, it is.

For years, we've been supplying discriminating data processing professionals worldwide with the finest magnetic media made anywhere... Dysan diskettes, mini-diskettes, disc packs, disc cartridges and single rigid disks.

Is there any reason why **you** should have to settle for second best?

Now you can buy Dysan precision diskettes and mini-diskettes direct from the Dysan sales office or authorized dealer near you. And they're not just any diskettes. They're certified 100% error-free both on **and** between the tracks to insure you of flawless performance. That means no lost data. No need to re-program. Or de-bug again. Dysan diskettes work the first time, every time. Think about how much time, energy and aggravation you can save.

Why wait for problems to occur to convince you that a bargain diskette is really no bargain? Call the Dysan office nearest you. Or stop in your nearest authorized Dysan dealer. Once you experience the Dysan difference you won't settle for anything less.





Our Media Is Our Message 5201 Patrick Henry Drive

Santa Clara, CA 95050

Listing 4: The machine-language equivalent to listing 3.

	00100	· CVCMD		(C) CODVETCUM 1	000 DV CIENN MECIED
	00110	;CKSTR		(C) COPIRIGHT I	980 BY GLENN TESLER
	00.120	;THIS PI		ESTS TO SEE IF B	
	00130	;STRING	COMPRES	SION ROUTINE. IF	IT IS, IT DISPLAYS
					CHECKS TO SEE IF THE . IF SO DISPLAY A BLANK.
		; NEXT, I			· II bo bibilai a bama.
	00170				
1C90		RST18H	EQU		;16 BIT COMPARE
25D9	00190	RST20H CMPSYM	EQU	25D9H	;TEST DATA TYPE ;CHAR TO DISPLAY
00B7	00210	•			CHAR TO DISTURI
F618	00220	,	ORG	63000	; <== YOU MAY CHANGE THIS
	00230				
F618 2127F6	00240				OVERLAY JUMP VECTOR
F61B 220740	00250		LD	(4007H),HL	;TO GIVE ME CONTROL. ;OVERLAY JUMP VECTOR
F61E 2140F6			LD	HL,CKBYT	TO BE ABLE TO TAKE IT
F61E 2140F6 F621 220A40	00280		LD	(400AH) HL	OFF SCREEN AFTERWARDS.
	00290	;			
					PS, DEPENDING ON WHERE
					T EXECUTION TIME DOS VIA "CKSTR/CMD").
	00320		(DUDIC	VIA DIDIDI OR	bob via cabily enb /:
F624 C3191A	00340		JP		;USE THIS TO ENTER BASIC
	00350	;	JP	402DH	OR USE THIS TO ENTER DOS
D(22 D2	00360		Date	(ap) III	CAUP UI COM DEM ADDD
F627 E3 F628 D5					;SAVE HL, GET RET ADDR. ;SAVE DE
F629 11FD28	00390		LD	DE DE,28FDH	; RET ADR IF IN STR CMPRSN
F62C CD901C	00400		CALL	DCm 1 OH	.TC TM MUAM ADDDCCCS
F62C CD901C F62F D1			DOD	DE	; RESTORE DE
F630 E3	00420		EX	(SP),HL	;SAVE RET ADD, GET HL
F631 200A	00430		JR LD	NZ, DORS18	; SAVE RET ADD, GET HL ; NOT ADDR, SKIP ; GET SYMBOL ; DISPLAY
F633 3EB7 F635 323F3C	00450		LD	(3C3FH),A	DISPLAY
F638 3E01 F63A 325AF6	00460		LD	A,1	;SET SWITCH
F63A 325AF6	00470		LD	(CMPSW),A	*
F63D C3901C	00480	DORS18	JP	RST18H	;DO 16 BIT COMPARE
F640 3A5AF6		CKBYT	T.D	A, (CMPSW)	GET SWITCH
F640 3A5AF6 F643 CB47	00510			0,A	;ON?
F645 2810	00520		JR	Z,DORS20	;NO, DO RST20
F647 AF	00530			A	;ZAP A
F648 325AF6 F64B 3A3F3C	00540		LD LD	(CMPSW),A A,(3C3FH)	;ZAP SWITCH ;GET SCN BYT
F64E FEB7	00560		CP	CMPSYM	IS IT THE CHAR?
F64E FEB7 F650 2005	00570		JR	NZ, DORS 20	; NO , DO RST20H
F652 3E20	00580		LD	A,32	; BLANK
F654 323F3C	00590	DORS 20		(3C3FH),A	PUT BYTE ON SCREEN
F657 C3D925	00610		JP	RST20H	;DATA TYPE
F65A 00		CMPSW	DEFB	U	;SWITCH
0043		ZSIZE	EQU	\$-SETSTR	
F618	00640		END	SETSTR	
00000 TOTAL	ERRORS				
CKBYT F640		00270			
CKSTR F627		00240	0500 005	***	
CMPSW F65A CMPSYM U0B7		00470 0	0500 005	40	
DORS18 F63D	2.550 F1 (E) (E) (C)	00440	0000		
DORS 20 F657		00520 0			
RST18H 1C90		00400 0	0480		
RST20H 25D9		00600 00630 0	0640		
SETSTR F618 ZSIZE 0043	00240	00030 0	0040		

be defined and then seldomly used arrays. All these definitions should be in an initialization routine at the end of the program, and a GOSUB at the beginning of the program should pass control to this initialization routine.

### Conclusion

Even if you don't add these detection routines to your system, knowing what the computer is doing will help you avoid rebooting unnecessarily (say, during string compression).

If you do add them, and use some of the variable-definition sequences suggested, then you'll find the computer doing more of what it was meant to do: making your life easier and more fun!

### LETTER PERFECT WORDS

WORD PROCESSING

### **ATARI 400/800**

### APPLE II & II+

EASY TO USE — Letter Perfect is a single load easy to use program. It is a menu driven, character orientated processor with the user in mind. FAST machine language operation, ability to send control codes within the body of the program, mnemonics that make sense, and a full printed page of buffer space for text editing are but a few features. Screen Format allows you to preview printed text. Indented margins are allowed. Data Base Merge with DATA PERFECT by LJK, form letters, accounting files and mailing labels only with MAIL MERGE/UTILITY by LJK. FEATURES — Proportional/Incremental spacing \* Right Justification \* File Merging \* Block movement \* Headers \* Footers \* Print Multiple Copies \* Auto Page Numbering \* Scroll forward/backward \* Search and Replaces \* Full cursor control \* Underlining \* Boldface \* Superscripts \* Subscripts \* Auto page numbering \* Insert character/line \* Delete character/line \* Centering \* Horizontal tabs/changeable \* Multifunction format line (line spacing — left margin — page width — lines/page — change fonts — top/bot margin adjust) MUCH MORE! \$149.95

### ATARI VERSION 2.0 #2001

Uses proportional font, right justified with Atari 825/Centronics\* 737, 739 printers. Uses EPSON MX\* Series + Graftrax/italicized font. Can mix type fonts on same page; mix boldface and enhanced font in same line with justification. Can be used with 16K Atari/400.

"Compared to the price of many other word processors, this package is a steal. It does everything the advertisement claims and more. On top of this the software is very easy to use." A.N.A.L.O.G. MAGAZINE

### APPLE VERSION 5.0 #1001

DOS 3.3 compatible — Use 40 or 80 column interchangeably (Smarterm — ALS; Videoterm-Videx; Full View 80 — Bit 3 Inc.; Vision 80 — Vista; Sup-R-Term — M&R Ent.) Reconfigurable at any time for different video, printer, or interface. USE HAYES MICROMODEM II\*LCA necessary if no 80 column board, need at least 32 K of memory. Files saved as either Text or Binary. Shift key modification allowed. Data Base Merge compatible with DATA PERFECT\* by LJK.

"For \$150, Letter Perfect offers the type of software that can provide quality word processing on inexpensive microcomputer systems at a competitive price." INFOWORLD

### DATA PERFECT T.M. LJK

### APPLE & ATARI DATA BASE MANAGEMENT

\$99.95

Complete Data Base System. User orientated for easy and fast operation. 100% Assembly language. Easy to use. You may create your own screen mask for your needs. Searches and Sorts allowed, Configurable to use with any of the 80 column boards of Letter Perfect word processing, or use 40 column Apple video. Lower case supported in 40 column video. Utility enables user to convert standard files to Data Perfect format. Complete report generation capability. **Much More!** 

### EDIT 6502 T.M. LJK

This is a coresident — two pass ASSEMBLER, DISASSEMBLER, TEXT EDITOR, and MACHINE LANGUAGE MONITOR. Editing is both character and line oriented. Disassemblies create editable source files with ability to use predefined labels. Complete control with 41 commands, 5 disassembly modes, 24 monitor commands including step, trace, and read/write disk. Twenty pseudo opcodes, allows linked assemblies, software stacking (single and multiple page) plus complete printer control, i.e. paganation, titles and tab setting. User can move source, object and symbol table anywhere in memory. Feel as if you never left the environment of BASIC. Use any of the 80 column boards as supported by LETTER PERFECT, Lower Case optional with LCG.

### LJK DISK UTILITY APPLE \$29.95

This menu driven program allows the user to manipulate a variety of different file types. Binary, Text, and Source files may be easily converted into each other. The program may be used with APPLESOFT\*, VISCALC\*, and other programs. These program files may be readily adapted for multiple use including editing with LETTER PERFECT word processings.

### MAIL MERGE/UTILITY

\$29.95 ATARI

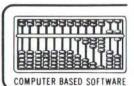
This menu driven program combined with LETTER PERFECT allows user to generate form letters and print mailing labels. With the Atari, you may CONVERT ATARI DOS FILES, or Visicalc files compatible for editing with LETTER PERFECT. Utility creates Data Base files for Letter Perfect.

### LOWER CASE CHARACTER GENERATOR

\$24.95

|"8\$%%!\)}\*+,--\8123456789:;<=>?@ABCOEFG HIJKLHNOPQRSTUVHXYZE\]^\_'abcdefghijklano parstuvvxuz(!)~

Lower Case Character Generator for the Rev. 7, Apple II or II+ computers. When installed, this Eprom will generate lower case characters to the video screen. Lower case characters set has two dot true descenders. Installation instruction included. Manual includes listing of software for full support and complete instructions for shift key modification. Compatible with LETTER PERFECT.



LIJI IM.

LJK ENTERPRISES INC. P.O. Box 10827 St. Louis, MO 63129 (314) 846-6124

DEALER INQUIRES INVITED

\*Trademarks of: Apple Computer — Atari Computer — Epson America — Hayes Microcomputers — Personal Software — Videx — Bit 3 Inc. — M&R Ent. — Advanced Logic Systems — Vista Computers

# WEIL CORIVE? YOU WILD with our variety of quality disk drives.

CADOU/V.OC

ASAP carries only the highest quality floppy disk drives, to provide you with years of trouble-free service and superior performance.

Data Trak™ double-sided, double-density drives from Qume® feature state-of-the-art technology. You get superior data integrity through improved disk life, data reliability and drive serviceability.

Data Trak™ 5 (ANSI 51/4" compatibility)	Call for price
Data Trak™ 8 (IBM compatibility)	Call for price

Shugart drives have been setting industry quality and reliability standards for years. Shugart's Bi-Compliant™ head assembly provides superior media compliance and high reliability.

Model 801 (standard floppy)	\$400.00
Model 850	\$640.00

ASAP also provides a full line of high reliability disk drive subsystems. For superior quality, high reliability disk drives, contact ASAP today.

Part No. — Description*	Price
CAB5V - Single cabinet for either Shugart or Qume 51/4'	,
floppy disk drives (cabinet only)\$	75.00
CAB5V/10 - Single cabinet with (1) Qume® DT-5, double-	-sided
double-density 51/4" floppy disk drive installed \$ 4	425.00
CAB8H — Dual cabinet for 8" floppy disk drives	
(horizontal mounting) \$ 2	225.00

(horizontal mounting)	\$	225.00
CAB8V — Cabinet for 8" floppy disk drives		
(vertical mounting)	S	225 00

CAB8H/V+1S — Dual cabinet with (1) Shugart SA801R	
8" floppy disk drive installed (horizontal or	

8" floppy disk drives installed (horizontal or	
vertical mounting)\$1	055.00
CAB8H+1M — Dual cabinet with (1) Mitsubishi double	-sided

Dual cabinet with (2) Chugart CA001D's

double-density, 8" floppy disk drive installed ..... \$ 695.00

CAB8H+2M — Dual cabinet with (2) Mitsubishi double-sided double-density, 8" floppy disk drives installed .....\$1155.00

HDC8/1-HD — Cabinet with (1) Priam 10 megabyte hard disk drive with Microbyte Controller . . . . . . . . Call for price

HDC8/1F+1HD — Cabinet with (1) Qume® DT-8 double-sided, double-density drive, and (1) Priam 10 megabyte hard disk drive with Microbyte Controller . . . . . . . . . Call for price

**CABBV/2F-9SMB** — Desk top cabinet for (2) 8" Shugart or Qume floppy disk drives, 9-slot motherboard, card cage, fan, dust filter, power supply, and all power and drive

\*All cabinets come complete with power supply, fan and internal cables.

T				
Terminals				<b>A</b>
	Model # Dialogue			Price \$ 875.00
Lear Signler	ADM-5	800		\$ 660.00
Lear Siegler	ADM-3A			\$ 635.00
Ampex Lear Siegler Lear Siegler Lear Siegler Lear Siegler Lear Siegler Lear Siegler Televideo Televideo Televideo	ADM-3A	+		\$1225.00
Lear Siegler	ADM-31			\$1095.00
Lear Siegler	ADM-32			\$1225.00
Lear Siegler	ADM-42			\$1195.00
Televideo Televideo Televideo	TVI 910			\$ 625.00
Televideo	TVI 9120			\$ 725.00 \$ 825.00
Televideo	TVI 9500			\$ 925.00
The second second	1 41 3500			323.00
Components				
4116's (200 n	S)/529	0-3		
Apple, TRS-80, H	eath			
1-15 S1.7 16-49 S1.6	0 each	50-99	S1	50 each
16-49 S1.6	0 each	100 up	S1	30 each
2114 L-2/200	nS			
Low-Power 1K x		RAM		
			. S2.6	60 each
1-16 S2 80 17-49 S2 70	each	100 up .	. S2	45 each
2708/450 nS				
1K x 8 EPROM		S4 00 ea	ch or t	8/\$28.00
		21.00 311	011 01 1	J/ 020.00
2716/5 Volt				
2K x 8 EPROM			S4	95 each
Regulators				
320T5				\$ 80
340T5				S.70
320T12				S.80
340T12				S.75
Connectors				
OOIIIIOOTOI S	1.0	10.5	24	25 up
DB25P	S2 00	S1 9	90	S1.75
DB25S	1-9 S2.00 S2.95	10-3 \$1.5 \$2.5	75	S2.50
DB25C	S 95	SI	35	S 75
100 Pin IMSAI				
Gold/S-100 Solde	rtail Con	nectors		
\$2.60 each or 10/				
Capacitors				
1 @ 12 Volt Ceran	nic	RC each	or to	0/87.00
DIP Sockets -	— Low P	rotile I in	Solderta	100
Description	C 15	10-49 5	0.99	C 11
16 pin tin st	S 16	S 14 S	13	\$ 12
18 nin tin st	S 19	S 18 S	16	S 14
20 pin tin st	S 25	S 23 S	.21	S 20
24 pin tin st	S .26	S 24 S	22	S .20
28 pin tin st	\$ 32	S 30 S	29	S 27
Description 14 pin fin st 16 pin fin st 18 pin fin st 20 pin fin st 24 pin fin st 28 pin fin st 40 pin fin st	5 .42	S .40 S	.38	S 34
SYSTEMS W	ITH SE	PICE fr	om	
CALIFORNIA				PEMS
		UILII	010	LINIO
FOR S-100 US				
32K Static RAM Bo Part Number 2033	200		Drice	CENE ON
16K Static RAM Ro	ard		Price.	2292.00
Part Number 2116	SC		Price:	\$300.00
16K Static RAM Bo Part Number 2116 64K Dynamic RAM Part Number 2065 780A CPU Board	Board			
Part Number 2065	5C		Price:	\$550.00
Z80A CPU Board Part Number 2810	۱۸		Drico	\$270.00
Floory Disk Contro	ller	0.000.000	erice.	SE10.00
Floppy Disk Contro Part Number 2422 CP/M™ Version 2	2A		Price:	\$370.00
CP/M" Version 2	2 Free V	7ith Purc	nase	
S-100 Mainframe Part Number 2200	۸۵		Prica	\$475.00
S-100 Motherboard				
Part Number 250	ΙΔ.		Price:	\$150.00
4-Port Serial I/O In	terface		_	****
4-Port Serial I/O In Part Number 2710 2-Serial, 2-Parallel Part Number 2710	)A		Price:	5285.00
Part Number 2719	A Board		Price	\$280.00
4-Port Parallel I/O	Board		11100.	0200.00
Part Number 2719 4-Port Parailel I/O Part Number 2720	)A		Price:	\$195.00
FOR APPLE II"	" USER	S		
Synchronous Serial	Interface			
Part Number 7712	A		Price:	\$149.00
Programmable Time	er		Delete	c ac ac
Asynchronous Sect	I Interfer		rrice:	2 92.00
Part Number 7710	A		Price	\$139.00
FOR APPLE II'' Synchronous Serial Part Number 7712 Programmable Tim Part Number 7440 Asynchronous Serial Part Number 7710 Calendar/Clock Mo Part Number 7424 Serial Number 7424 Serial RCD Asta-f	dule	Market 1		
Part Number 7424			Price:	\$ 99.00
Bort Number 747	Converte	r	Dring	e de oo
2K ROM/PROM M	lodule		rice.	3 93.00
Part Number 7114	IA		Price:	\$ 85.00
Parallel Interface				
art Number 7720	Α		Price;	5125.00
Part Number 7426 Part Number 7476 Part Number 7477 2K ROM/PROM M Part Number 7114 Parallel Interface Part Number 7726 Arithmetic Process Part Number 7811 Part Number 7811 Part Number 7726 Part Number 7726 Part Number 7726	Δ		Price	\$340 nn
Centropics Printer	nterface	21111	rrice;	3349.00
art Number 7728	ΑΑ		Price:	\$125.00

Printers		
Epson N	NY_RO	
	Dot Matrix Printer	
	set: full 96-character A	SCII with
descender		
Graphics of	characters: 64 block cf	naracters
Centronics	s-style 8-bit parallel int	terface
	Apple, TRS-80, RS-232 i	
optional.		
MX-80 F	T/Friction Feed	
MX-100	/132 Column	
	ot Matrix Printers	
	olumn printer w/tractor	
	@ 80 characters per line:	76 lines
per minute	400 000	
Print Speed	column printer w/tractor	
	@ 136 characters per line	: 76 lines
per minute		
Print Speed:		
	column printer w/tractor @ 136 characters per line	114 lines
per minute		. 114 11116
Print Speed:		A
	RS-232C interfaces stand & 83A. 2K serial buffer boa	
	all models. 84A: Centro	
parallel int	erface optional; Hi-RES	
standard.	DOICE & DELIVERY	
	PRICE & DELIVERY	
	allel Interface:	
	Cable	\$69.95
Standard     Compatible		-Contains
	le with Epson & Okidata P Firmware (2708)	rinters
	Cables: \$20.00	
	ari to Epson Printer	
	RS-80 to Epson/Okidata P -232 (male to male)	rinter
On the Late	I OFI 1	\$55.00
<ul> <li>Asynchroi</li> </ul>	17 <b>8CE SEI-1</b> 10US 300, 1200, 2400 or 96	00 BPS
	e with Epson Printers	
• 75 to 9600		D. I
Manufacturer  Anadex-9501	W/2K buffer	S1295.00
C.Itoh Pro/W	/riter II Ca	I for price
C.Itoh F-10 P	rintmaster Ca ments-810	If for price
Modems	mems-ord	.51050.00
Manufacturer	Model #	Price
Novation	CAT	\$ 149.00
Novation Novation	d-CAT Auto-Cat	\$ 160.00 \$ 229.00
DC Hayes	Smart Modem	\$ 235.00
DC Hayes	Micro Modem II	\$ 320.00
DC Haves	(Apple) Micro Modem 100	\$ 320.00
DC Hayes Lexicon	Lex-11	\$ 139.00
Livermore	LIV-Star 20M	\$ 149.00
UDS	UDS 103 LP (300 Bd)	\$ 185.00
UDS	UDS 202 LP (1200 Bd)	\$ 245.00
Monitors	122 2 2 2 2	20
Manufacturer Amdek	Model # 100/12" B&W	\$ 110.00
Amdek	100/12 B&W	\$ 169.00
Amdek	100G/12" Grn.	\$ 125.00
Amdek	Color-1 13"	\$ 350.00
Sanyo Sanyo	DM 5109CX/9" Grn. DM 5012/12" B&W	\$ 175.00 \$ 270.00
Sanyo	DM 5112ex/12" Grn.	\$ 290.00
Sanyo	DM C6013/13" Color	\$ 425.00
Zenith	ZVM-121/12" Grn. IMPUTER PRODUCT	\$ 115.00
		10
ATARI 800	nal Business Computer F	osturos.
	uter console	Gatui Go.
Atari 8		
<ul> <li>57 full</li> </ul>	stroke alpha-numeric k	eyboard
	our function keys	
RF mo	tor's manual	
Power		
Call for		
ATARI 400		\$349.00
	nal Accessories	
		rice
	rogram Recorder S	
	a ser eller i de la companya de la c	
	sk Drive System \$	455.00
	sk Drive System \$	455.00

000	40 Caluma Thormal	Ctamanda C	acteidae	A 110-11	10.50
822	40 Column Thermal Printer \$ 299.00		artridge Cartridge		
820	40 Column Dot Matrix Printer \$ 279.00	D	SKETTES 1	7	P
825	80 Column Dot		51/4" Dis	cettes	
222	Matrix Printer \$ 625.00	Part #	Secto	ir.	Price
830	Acoustic Modem \$ 159 00	MD525-01 MD525-10	Soft Hard	10	10/\$27.50 10/\$27.50
850	Interface Module \$ 169.00	MD525-16	Hard		10/\$27.50
410	Cassette Recorder \$ 80.00	V 22472250725100	8" Disk		000000000000000000000000000000000000000
CX30-04	Paddle Controls \$ 17.95	FD32-1000 FD34-1000	Hard Soft	2	10/\$35.00 10/\$35.00
CX40-04	Joysticks (pair) \$ 17.95 UCING ASAP's	1 000			107300.00
	0 16K RAM Module: \$55.00		Memo 5¼" Dist		
	arranty parts & labor	Part #	Side/Dens	Sector	Price
Softwar		MEM 3481 MEM 3483	1/Dbl 1/Dbl	Soft Hard 10	10/\$26.50 10/\$26.50
Atari		MEM 3485	1/Dbl	Hard 16	10/\$26.50
	II	A series a series and	8" Disk		
	eakout	MEM 3060 MEM 3101	1/Sgl 2/Sgl	Soft Soft	10/\$35.00 10/\$45.00
	\$ 32.00	MEM 3090	1/Dbl	Soft	10/\$45.00
	sel	MEM 3102	2/Dbl	Soft	10/\$55.00
	ers		Scotch	3M	
	\$ 32.00		51/4" Disk		
Accemble	mposer	Part # 744-0	Side/Dens 1/Sql	Sector	Price 10/\$33.00
		744-10	1/Sgl	Hard 10	10/\$33.00
Space Inv	vaders \$ 30.00	744-16 745-0	1/Sgl 2/Dbl	Hard 16 Soft	10/\$33.00 10/\$49.00
	\$ 12.95 ommand \$ 32.00	745-10	2/0bl	Hard 10	10/\$49.00
	n	745-16	2/DbI	Hard 16	10/S49.00
Graph It .			Maxe	II.	
	zar	200	51/4" Disk	ettes	12.0
	ping	Part # MD1	Side/Dens 1/Sgl	Sector Soft	10/\$32.00
Stock Cha	arting	MD2D	2/Dbl	Soft	10/\$44.00
	alysis	MH1 MH2D	1/Sgl 2/Dbl	Hard 16 Hard 16	10/\$39.00 10/\$50.00
	cessor	WITED	8" Diske		107-550.00
Personal I	Finance \$ 64.95	FD1-128	1/SgI	Soft	10/\$41.00
	BASIC \$ 75.00	FH1-32 FD2-XD	1/Sgl 2/Dbl	Soft 32 Soft	10/\$41.00 10/\$50.00
Datasoft Atari Mail	ing List Disk 19.95	102-40	21001	3011	10/330.00
Atari Char	acter Generator Disk 16.95		phant Memo		
Text Wiza	rd Disk 89.95	Part # EMS 1	Side/Dens 1/Sql	Sector Soft	10/S25.00
Micropain	ter Album 1 Disk 16.95 ter Album 2 Disk 16.95	EMS 2	1/Dbl	Soft	10/\$27.50
	ccessory 30.00	EMS 3 EMS 4	1/Dbl 1/Dbl	Hard 10 Hard 16	10/\$27.50 10/\$27.50
	Design Software, Inc.	EMS 5	2/Dbl	Soft	10/\$33.00
On-Line Svs	I-RES 48K	EMS 6 EMS 7	2/Dbl 2/Dbl	Hard 10 Hard 16	10/\$33.00 10/\$33.00
	v #0 — Mission: Asteroid Disk 19.95	EWIS /	27001	natu io	10/333.00
HI-RES Ad	v #2 — Wiz & Princess Disk 25.00		Control		
Hoadwork	Disk	Part #	8" Diske Side/Dens	ttes Sector	Price
Softporn A	Adventure (X-rated) Disk 25.00	1221-60	1/Sgl	Soft	10/\$38.00
	Step Disk 29.95	1223-00 1225-00	1/Dbl 2/Dbl	Soft Soft	10/\$43.00 10/\$48.00
Personal So	1072	1225-00	51/4" Disk		10/546.00
Visicalc Di		1241-00	1/Sgl	Soft	10/\$25.00
Arcade Plus	ster (Cassette) S 25 00	1241-10 1241-16	1/Sgl	Hard 10 Hard 16	10/\$25.00
	iter (Disk)	1242-00	1/Sgl 1/Dbl	Soft	10/\$25.00 10/\$30.00
	ENTERTAINMENT SYSTEMS	1242-10	1/Dbl	Hard 10	10/\$30.00
Activision	Sastridas 40.50	1242-16 1244-00	1/Dbl 2/Dbl	Hard 16 Soft	10/\$30.00 10/\$40.00
	Cartridge	1244-10	2/Dbl	Hard 10	10/\$40.00
Checkers	Cartridge 18.50	1244-16	2/Dbl	Hard 16	10/\$40.00
Fishing De	erby Cartridge 18 50	FLEXCASE Disk	Storage		Call for price
Bridge Car	tridge		SRW	1	
Tennis Car	rtridge 18.50		Media Storag		
Laser Blas	st Cartridge 18.50	Part #	Size		Price
	Cartridge	SRW-5 SRW-8	517		\$2.50 ea \$3.25 ea
					30.23 Cd
	prices subject to change without no AP offers a 15-day buyer protection			k guarant	no if not
	ally satisfied.	m policy_full	money-bac	k guarant	ee ii not

Ordering Information: name, address, phone, ship by: UPS or Mail. Shipping charge: add \$2.50 up to 1 lb. for UPS blue; add \$1.50 for U.S. Mail (U.S. only) (\$25.00 minimum order). Call for larger shipments.

Terms: We accept cash, check, money orders, Visa & Master Charge (U.S. Funds only). Tax: 6% Calif. res. COD's and terms available on approval (school PO's accepted).



Toll free outside California: (800) 421-7701

Inside California: (213) 595-6431 (714) 891-2663

# Anatomy and Development of a Batch-Processing System

A software system lets your computer run a series of programs without your intervention.

Gene Walters 779 Vereda Court San Iose, CA 95123

Most microcomputer programs require responses or input from the user during their execution. For some applications, however, interactive computing has drawbacks. Programs that include updating, sorting, and listing files can take the computer a lot of time and leave you sitting idle. And many programs—even common ones for the home-do require such tasks. Suppose you want to keep a household inventory sorted by item descriptor and also by room or location or you want to catalog your collection of phonograph records and sort by title, performing artist, and composer. Programs for either of these domestic tasks would require time-consuming sorts.

Two basic approaches can be used to design programs that include lengthy operations like those described above. You can write several programs—one for updating, one for sorting, one for listing, and one for each additional function required—or you can write one large program that combines all the functions.

Each approach has advantages and disadvantages. Using the first method, you have more RAM (random-access read/write memory) free for sorting. However, you must run each program separately, which leaves you an unpleasant choice. You

can watch the computer while one program executes so that you will be ready when the time comes to initiate the next program, or you can leave the computer and come back later. If you wait and watch, you waste your own time. If you leave and come back, you will find either that the program has not finished running or that the program has finished and the computer has been idle for some indefinite period. I find it frustrating to run back and forth to check on the computer's progress.

The second approach lets you enter all the desired options at the beginning of the program's run and then let the computer do all the required processing. Because all the program functions reside in memory at the same time, however, the computer may have little memory space free for processing. As a result, the program will run more slowly.

I wanted the best features of both methods: a third approach that would provide for continuous unattended running of all the required functions but leave plenty of memory space free for processing. I decided to write an executive program that would let me set up a file containing all the instructions and commands that the computer would need to run a number of separate programs in

succession without operator intervention. This approach is called *batch* processing.

I developed my batch-processing system on a North Star Horizon computer with 56K bytes of RAM, a video-display terminal, and a printer. I tested the programs on both release 4 and release 5.2 of North Star system software. You can use batch-processing software like mine on any microcomputer that has a CHAIN feature (which permits one program to call another).

### Design Goals

I tried to set up the executive program and its supporting programs in a way that would permit me to use them in many other applications without making extensive changes. I wanted to have one executive for a system consisting of many programs that would support an unattended run of several programs. I required that maximum memory, date and time information, and common parameters be available for all programs and that the parameters specific to the execution of one program be easily available.

Other features that I felt the batchprocessing system should include are error checking of all input parameters

## How to maximize your Model III:

You don't have to settle for standard equipment. Let MTI and Alpha Byte help you build the Model III you want.





### MTI FLOPPY DISK ADD-ON KITS

Now you can upgrade your 16K level II Model III to a full 48K Disk System the easy way with MTI's Double Density Disk Controller and your choice of Disk Drives. You can choose 40 track, Double-Sided 40 track or Double-Sided 80 track Drives to supply your disk storage needs. Forty Track Drives store 175K, Double-sided 40 Track drives store 350K. Four Double-Sided 80 Track Drives provide up to 3 MEGABYTES of On-Line storage.

### INTERNAL DISK DRIVE KITS

The first drive kit includes one Tandon Disk Drive. MTI Double Density Controller, Switching power supply, 32K of RAM, all mounting hardware, cables and Detailed Installation Instructions. The second internal drive kit includes a second drive and the necessary installation hardware.

40 TRACK DRIVE SYSTEM DRIVE NO. 1 KIT DRIVE NO. 2 KIT	
40 TRACK DUAL HEAD SYSTEM DRIVE NO. 1 DRIVE NO. 2	
BO TRACK DUAL HEAD SYSTEM DRIVE NO. 1 DRIVE NO. 2	

### EXTERNAL DRIVE KITS

Two external drives can be attached to any dual drive Model III Computer.

40 TRACK EXTERNAL DRIVES	250.00
DRIVE NO. 3	
DUAL HEAD 40 TRACK EXTERNAL DRI	VES
DRIVE NO. 3	479.00
DRIVE NO. 4	459.00
DUAL HEAD 80 TRACK EXTERNAL DRI	The state of the s
DRIVE NO. 3	
DRIVE NO. 4	639.00

### **FIVE MEGABYTE EXTERNAL** WINCHESTER HARD DRIVE......2795.00

Add the Ultimate in Fast High Capacity Disk Storage to any Model III Floppy Disk system. Reliable Winchester technology provides enough storage for the largest business files. Winchester disk drives have greatly increased data transfer rates and that means faster program and file loading. This is a complete self contained system that connects to a standard Model III Disk System in minutes without any modification to the com-

### MODEL III DIAGNOSTIC PROGRAM . . . . . . 49.95

A complete diagnostic program for the Model III. Tests RAM and ROM, video display and all disk drives. Catch problems while they're small and be sure that your Model III is in perfect running

MODEL III CP/M-80 NOW AVAILABLE! ... 799.00 CP/M® & 80 Column Kit.

Now you can run proven CP/M based software on your Model III, with standard 80-column display. A simple internal modification will transform your Model III into a NEW computer and allow you to run CP/M the industry-standard operating system and assure you of a large supply of fine software. Includes CP/M 2.2.

### 

Now you can run your Model III at 4 MEGAHERTZ. that's almost double the standard speed. This simple-to-install kit does require some soldering.

### MODEL III COOLING KIT......44.95

Heat build up is a major cause of system failures and 'flakey' operation. This kit provides excellent cooling.

### DOSPLUS OPERATING SYSTEMS FOR THE MODEL III

Solid BUG-FREE operating systems for the Model III. Supports different size drives on the same system and Basic Program Chaining with variables saved in memory

40 TRACK							99.00
80 TRACK.							119.00
EXPANDED	DOSPLUS	3.3.8					149.00
Read and	Write 40	Track	Diskett	es on	an 80	Track	System.
HARD DISK							
Supports							

We guarantee everything for 30 days. If anything is wrong, return the item and we'll make it right. And, of course, we'll pay the shipping

We accept Visa and Master Card on all orders;

COD orders, up to \$300.00.

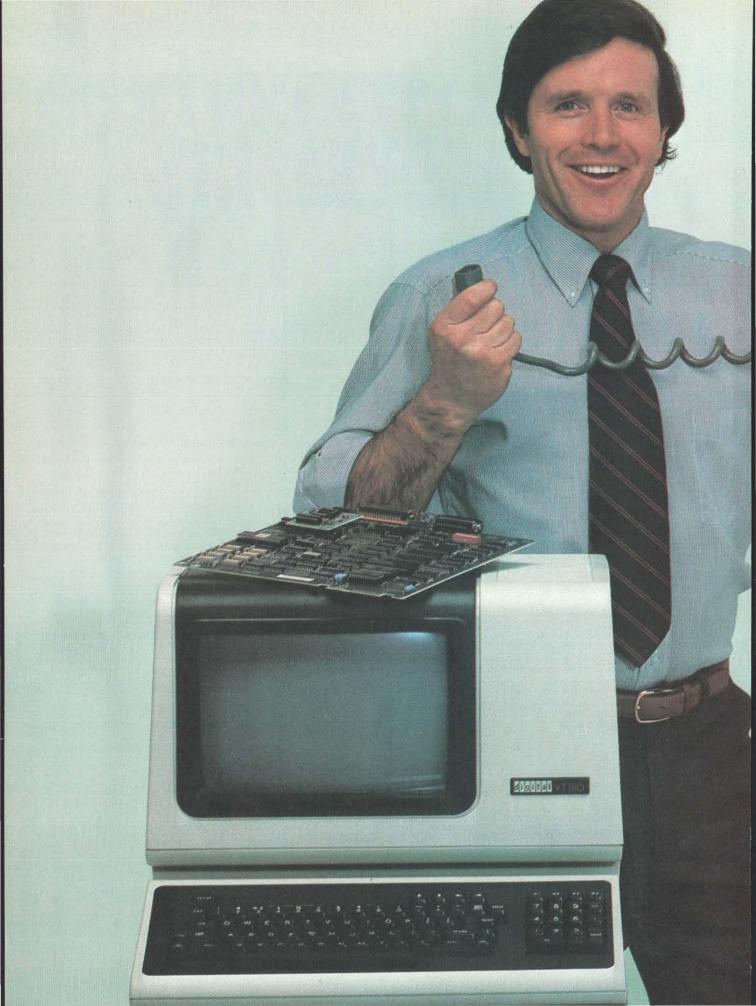
Add \$2.00 for standard UPS shipping and handling on orders under 50 lbs, delivered in continental U.S. Call for shipping charges over 50 lbs. Foreign, FPO and APO orders add 15% for shipping charges over 50 lbs. shipping. Californians add 6% sales tax.

Prices quoted are for stock on hand and are subject to change without notice.

31245 LA BAYA DR, WESTLAKE **VILLAGE, CALIFORNIA 91362** 

To order, or for information, call:

To use our 24-hour modem order line, call: (213) 883-8976.



# Now you don't have to decide between a personal computer and aVT100 terminal.



can turn a VT100 terminal into a personal computer that uses the CP/M® operating system.

It's called Digital's Personal Computing Option. You can purchase just the option, or you can buy the complete terminal/computing package called the VT180.

Either represents significant advantages over the choices available to you now. For now, you can provide access to a large computer and personal computing at the same terminal.

More than that, you save the additional cost of putting personal computers and terminals side by side on the top of a desk.

With the CP/M operating system Digital's personal computing terminal will run the literally hundreds of programs available for it. Including word processing, mailing lists, financial modeling, statistics, even data base communications-in addition to the many more being specially edited for this terminal.

And by virtue of the fact that Digital's personal computing terminal is VT100-based, you get all the features that people buy VT100s for in the first place. Features like smooth scrolling with up to 132 columns display, split-screen viewing, double-height and width characters, and reverse video.

Plus a reputation that's second to none in the industry. Plus Digital's service, on-site, anywhere in the world.

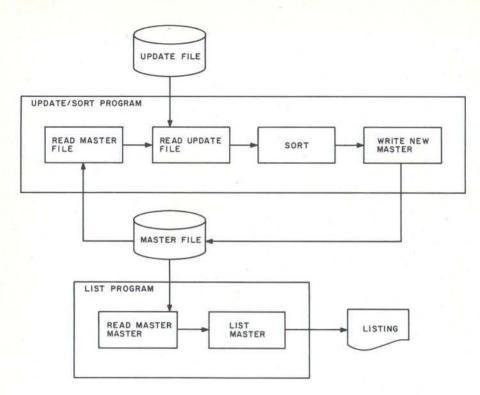
All of this should make great sense when you're confronted with the choice of terminals or personal computers.

Canada, Ltd.

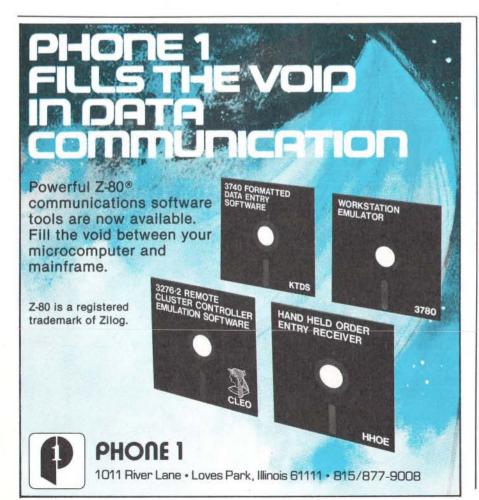
Because now you can pick one and get both. See your Digital dealer for more information or write: Digital Equipment Corporation, Terminals Product Group, 2 Mt. Royal Avenue, UPI-5, Marlboro, MA 01752. Telephone toll-free 800-225-9378 (outside the continental U.S. or in Massachusetts call 617-480-4077) between 8:30am and 5:00pm Eastern time. In Europe: 12 Av. des Morgines, CH-1213 Petit-Lancy/Geneva. In Canada: Digital Equipment of



Circle 445 on inquiry card.



**Figure 1:** A diagram of relations between the update/sort program and the list program in the Article/Book Maintenance System. Either the master file or an update file must be present before execution of the update/sort program.



when the executive is set up to run a batch job, video display of processing status during execution, a built-in HELP command, automatic seeking of the batch-processing system on any disk drive, and cancellation of any command during job setup. The system should allow for both short and long forms of commands to the executive and for the easy addition of new commands, new programs, and additional parameters for all programs or a single program. Finally, I wanted to use general utility routines in the executive to set up job-control information.

### Constructing the System

To illustrate how to construct a batch-processing system, I'll describe a set of four programs, called the Article/Book Maintenance System, for maintaining and listing a file on books and articles and show how this small system can serve as the basis for other systems.

The Article/Book Maintenance System maintains one record (a collection of a fixed number of related data items) for each article or book. Each record contains three fields (data items), one each for the title, the author, and the publication date. The system has two programs that work directly on the data:

- a program that creates or updates the article/book master file and sorts the information by any of the three fields
- a program that lists the current master file

Figure 1 shows the relationships among the functions performed by the update/sort program and the list program. Note that either the master file or an update file must exist before the update/sort program is run.

Execution of a single job may require calling either the update/sort program, the list program, or both more than once. A simple example is the following sequence:

 Update an existing master file with an update file and sort the information by title.

### INTRODUCING CALCSTAR.

# several powerful ways.

setting software product in the WordStar tradition. CalcStar is MicroPro's new electronic spread sheet and financial modeling program —

Presenting CalcStar—another standard-

a sophisticated, yet easy to use, calculating and planning tool for CP/M® based computers.

The ultimate electronic spread sheet. CalcStar calculates solutions to complex numerical problems in business and finance. Helps you make budget plans and sales forecasts with greater speed and accuracy. And projects figures into the future to answer the

'what if" questions you face in business. And CalcStar also has a unique MicroPro advantage: It joins with WordStar to combine spread-sheet and word-processing capabilities in

CalcStar software eliminates the need to use ledger paper ever again. It turns your video screen into a "window" on a giant electronic ledger sheet, with up to 600 entries arranged the way you want. Then, by inserting formulas into CalcStar, you create financial models that simulate the future numerically. And predict the outcomes of your business decisions.

When you notice what CalcStar can do for your business, you'll wonder how you ever got along without it. (If you're now a WordStar user, you probably already know the feeling.)

The MicroPro bonus. Like WordStar, CalcStar is packed with innovative features that make it versatile and easy to use. Features like Automatic Forms Mode, which lets an inexperienced user enter data into a spread sheet quickly and with less chance of error.

CalcStar's greatest innovation is its ability to join with WordStar. Which means, for example, you can use WordStar's printing options, like boldface and underlining, to dress up financial documents. And you can insert sections of CalcStar's spread sheets into your WordStar documents.

This kind of flexibility should come as no surprise if you're already familiar with the MicroPro software family a line of programs designed to work together to multiply your problem-solving power. Visit your MicroPro dealer to find out just how big a difference all our products can make in your business. We predict you'll discover it's not just CalcStar or WordStar that's indispensable. It's MicroPro.



A glance at CalcStar features

Runs on CP/M version 2.0 or above, with 80-column screen, addressable cursor, and at least 48K memory. 56K or more is recommended for fullest utilization.

Highly user friendly: Call up full screen of help or use help menu. WordStar-like cursor commands User's guide shows you the basics. Install from menu OR a WordStar file.

Stores formulas and formats along with data, for convenience and less chance of error.

Math functions include average, minimum, maximum, logarithms, exponents, and regression

SOFTWARE THAT MEANS BUSINESSTM



1299 Fourth Street, San Rafael, California 94901 (415) 457-8990; Telex: 340-388

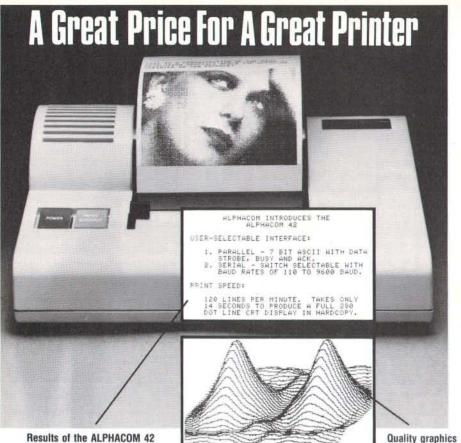
> CP/M is a trademark of Digital Research, Inc. Dealer and distributor inquiries invited

DalaStar™ MallMerge WordStar"

SUDEPSOPT" WordMaster

Spellstar

CalcStap\*\*



Quality graphics and symbols for business and pleasure.

15 Day Home Trial

Thermal Printer

### FAST · QUIET · LOW COST

Order by Phone Today!

The remarkable ALPHACOM 42 high speed 40 column thermal printer is now available through this mail offer for only \$199.95.\* For Apple, Commodore, Atari and other home computer users, this is the opportunity to own one of the most reliable printers ever introduced. It's a fool-proof printing mechanism that is backed by field experience with more than a million similar units in industry, government and education, plus a 90 day warranty. Fast, quiet and easy to operate, the ALPHACOM 42 prints up to 120 text lines per minute! Dump a 24 line CRT in 14 seconds!

Order your ALPHACOM 42 today using the convenience of Master Card or Visa. Call for immediate action, or mail your check to ALPHACOM.

In California, dial 408-559-8000.

800 · 538 · 7047

\*Interface Cables available for as little as \$24.95.

Alphacom

Visa

2323 S. Bascom Avenue, Campbell, CA 95008

MasterCard

- 2. List the sorted master file.
- 3. Sort again, but by author.
- 4. List the newly sorted master file.

The Article/Book Maintenance System has an executive program and a subexecutive which together enable the system to call the update/sort and list programs in sequences like the one above. I'll discuss the executive and subexecutive programs in detail after I describe how the system looks in operation.

The system accepts an update file in the format of a North Star BASIC program file. Adoption of this format permits use of the North Star editor. normally used for entering BASIC programs, with the Article/Book Maintenance System. Listing 1 shows the formats for update data-title, author, and date on each new book or article. The format requires line numbers and quotes. In the absence of the quotes, the North Star editor would convert any BASIC keywords in the line to an internal representation different from an ASCII (American Standard Code for Information Interchange) string. Note the use of the minus sign after the line number of a record to be deleted.

Listings 2 through 5 show examples of two typical job executions in the Article/Book Maintenance System. Underlined text in the listings represents user input. Listing 2 shows an update file created with the North Star editor and saved under the name UPDATE1. The first job, shown in listing 3, is a sample run of the main program in the Article/Book Maintenance System. This run uses the file UPDATE1 to create a new master file, MASTER, then sorts and lists MASTER. Since no MASTER file existed when the job was set up, the program asks the user during the input dialogues of both the update/sort and the list commands to confirm that it's all right to proceed without MASTER.

Listing 4 shows the new update file, UPDATE2. The second run of the main program appears in listing 5. The dialogue in listing 5 causes MASTER to be updated with the data in UPDATE2, then sorted and listed by title, then sorted and listed by

# BOY, IS THIS COSTING YOU.

It's really quite basic: time is

money.

And BASIC takes a lot more time and costs a lot more money than it should every time you write a new business software package.

Especially when you could speed things up with

dBASE II.

### dBASE II is a complete applications development package.

Users tell us they've cut the amount of code they write by up to 80% with dBASE II.

Because dBASE II is the high performance relational

database management system for micros.

Database and file handling operations are done automatically, so you don't get involved with sets, lists, pointers, or even opening and closing of files.

Instead, you write your code in concepts.

And solve your customers' problems faster and for a lot less than with BASIC (or FORTRAN, COBOL or PL/I).

### dBASE II uses English-like commands.

dBASE II uses a structured language to put you in full control of your data handling operations.

It has screen handling facilities for setting up input

and output forms.

It has a built-in query facility, including multikey and sub-field searches, so you can DISPLAY some or all of the data for any conditions you want to apply.

You can UPDATE, MODIFY and REPLACE entire

databases or individual characters.

CREATE new databases in minutes, or JOIN databases that already exist.

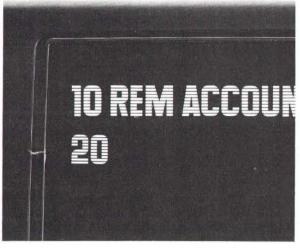
APPEND new data almost instantly, whether the file has 10 records or tens of thousands.

SORT the data on as many keys as you want. Or INDEX it instead, then FIND whatever you're looking

for in seconds, even using floppies.

Organize months worth of data in minutes with the built-in REPORT. Or control every row and column on your CRT and your printer, to format input and output exactly the way you want it.

You can do automatic calculations on fields,



records and entire databases with a few keystrokes, with accuracy to 10 places.

Change your data or your entire database structure without re-entering all

your data.

And after you're finished, you can protect all that elegant code with our runtime compiler.

### Expand your clientbase with dBASE II.

With dBASE II, you'll write programs a lot faster and a lot more efficiently. You'll be able to write more programs for more clients. Even take on the smaller jobs that were out of the economic question before. Those nice little foot-in-the-database assignments that grow into bigger and better bottom lines.

### Your competitors know of this offer.

The price of dBASE II is \$700 but you can try it

free for 30 days.

Call for our Dealer Plan and OEM run-time package prices, then take us up on our money-back guarantee. Send us your check and we'll send you a copy of dBASE II that you can exercise on your CP/M® system any way you want for 30 days.

Then send dBASE II back and we'll return all of your

money, no questions asked.

During that 30 days, you can find out exactly how much dBASE II can save you, and how much more it lets

you do.

But it's only fair to warn you: business programmers don't go back to BASIC's.

Ashton-Tate, 9929 Jefferson, Los Angeles, CA 90230. (213) 204-5570.



®CP/M is a registered trademark of Digital Research.



author. The end of listing 5 shows both the system's listing by title and the listing by author. This simple example, which uses the same system of programs repeatedly to do a set of tasks and requires no attention from the operator after the job is set up. shows the convenience and flexibility of the executive of the Article/Book Maintenance system.

**Programs** 

The Article/Book Maintenance System contains four programs. The main executive (MAIN) program handles all interaction between the Article/Book Maintenance System and the user. Handling the user interaction includes checking the validity of all input parameters. In addition, the MAIN program constructs a jobcontrol file containing both the global data (to be used by all programs) and the parameters entered by the user to

determine the course of program execution. MAIN provides a set of utility routines that can be used for the MAIN program in other batchprocessing systems.

The subexecutive (%!) program reads the next entry in the job-control file to determine which program to call next for execution.

The update/sort (%!SORT) program performs updates and sorts. It reads global data from the jobcontrol file and uses the data as parameters for the updates and sorts. The data read include parameters for listings (top and bottom margins, number of lines per page) and for adjusting the position of the paper after an error listing, the names of files to be sorted, and the field to use for the sort. After completing the update and the sort, this program returns control to the subexecutive.

The listing (%!LIST) program

reads parameters from the jobcontrol file, including the name of the master file to be listed and the order of fields for the listing.

### Data Files

The Article/Book Maintenance System contains three kinds of data files. The job-control file (%!JCL) contains all the parameters and control information for the system. It is organized as a North Star Type 3 data file; figure 2 shows the file's format. Update files are defined by the user; they are files of North Star Type 2, which is normally used for BASIC programs. Master files, also userdefined, are files of North Star Type 3 as well.

File-naming conventions of the Article/Book Maintenance System are as follows: the MAIN program can have any name you wish, the subexecutive is %!, the job-control file is

Listing 1: The formats for data in an update file for the Article/Book Maintenance system. These formats were chosen so that the North Star BASIC editor could be used for entering and deleting data in the batch-processing system.

### Add Entry

line number"title\author\date"

or

line number"title\author\date\"

Example:

10"Art of Computer Programming - Fund. Alg. Vol I\Knuth, D.E.\1968" 20"Compiler Design Theory\Lewis, P.M., et al\1976"

Delete Entry

Same as add except for the addition of a minus sign between line numbers and the quote. All master file entries whose fields match the fields specified in the delete entry will be deleted. In other words, one, two or all three fields may be used in making a match for deletion.

Example:

10-"Erroneous Title\Author\1973"

Information Line (213) 996-2252 TOLL FREE MAIL ORDER LINES (800) 423-5886 Outside Calif



### SPECIAL OF THE MONTH

HP 41CV **OUR PRICE** 

MSL 239.00 325.00

auc 86.00 EXPANSION BOARD Q STAR 16K RAM BOARD

> MSL 199.00

**OUR PRICE** \$ **99**.00 Sauce

100.00

### MICRO-SCI APPLE II+ COMPATIBLE DRIVE



MSL

189.00

HEWLETT PACKAGO

W/O CONTROLLER MSL OUR PRICE 379.00 449.00

COMPARE TO COMPARE TO 216.00 APPLE DRIVE 146.00 APPLE DRIVE APPLE IS A REG. TRADE MARK OF APPLE COMPUTER

LE MONITOR

9" GRN. PHS. MONITOR 12" GRN. PHS. MONITOR

\$119.00

OUR PRICE Save

### **IBM** IBM PERSONAL COMPUTER INCLUDES 2 Drives

Colour Graphic Board 64K Memory 

CALL FOR PRICE

\*Subject to availability



### CALL FOR PRICE

APPLE IS A REG. TRADEMARK OF APPLE COMPUTER



MSL OUR PRICE

2500.00 1595.00

905.00

### FRANKLIN 64K **ACE 100** APPLE COMPA

INTRODUCTOR

MSL 1595.00 Call for Price

The Franklin ACE\* 100 is a professional personal computer that is hardware and software compatible with the Apple II† and includes many features not found on the Apple unit. All programs written for the Apple II will run on the Franklin ACE 100 without modification including those using high and low resolution black and white graphics. The ACE 100 is plug compatible with Apple. All peripherals designed for the Apple II will operate with the ACE 100 without modification.

with the ALE 100 winout modification.

The Franklin ACE 100 is a personal computer with the power, quality and reliability to meet the most demanding applications of the business professional. It comes complete with 64K of RAM memory which fulfills the demanding memory requirements of VisiCaic and DPM based programs. The system includes a full upper and lower case keyboard with true shift capability and a numeric pad. The computer generates a full character set to the video screen that displays upper and lower case characters. case characters.

The 72 key keyboard includes an alpha lock key which simplifies operation with existing Apple software. The numeric pad cluster includes special keys such appered, plus, minus, greater than (go to) and asterisk (multiply) that are used frequently with VisiCalc.

The Franklin ACE 100 includes a joystick/ game paddle connector, a speaker and eight peripheral connectors. A built-in fan and a 50 watt power supply permit all eight peripheral connectors to be used without power or overheating problems.

### Franklin ACE 100 Features

- Apple 11 compatible 64K of RAM memory
  - · Alpha lock shift key VisiCalc friendly 50 watt power supply
  - Upper and lower case Typewriter-style keyboard . Built-in fan

### COMPARE OUR COMPUTER

FEATURES	APPLE II	FRANKLI ACE 100
Computer with 48K RAM Memory	\$1530.00	STD
Microsoft 16K RAM		
Card (16K RAM Memory)	195.00 (option)	STD
ABT 10 Key Pad	125.00 (option)	STD
Videx Keyboard Enhancer	149.00 (option)	STD
R.H. Electronics Super		
Fan II (Muffin Fan)	69,00 (option)	STD
TOTAL	\$2068.00	\$1595.00

### The professional's choice: Hewlett-Packard's HP-85

70.00

HP 85

MSL OUR PRICE 544

775.00 2750.00 \$1975.00



RADIO SHACK 48K TRS 80 W/2 DRIVE MOD III



OUR PRICE San MSL 2495.00 \$1799.00 696.00



OUR PRICE MSL 299.00 44.00

1 Year Extend

ERVICE

ELECTION

**ATISFACTION** 



MSL OUR PRICE Save 3495.00 \$2649.00

846.00



\*NEC PC 8031 12" Grn. Phs. Video Monitor

MSL OUR PRICE SAME

744.00 2839.00 \$2095.00





MSL PRICE 645.00 216 00 429.00 MX 80 MX 80FT 745.00 210.00 535 00 276.00 995.00 MX 100 719.00



4940 - DUAL DISK DRIVE MSL OUR PRICE Save 2590.00 \$1978.00 612.00

Signature

WE RESERVE THE RIGHT TO CORRECT TYPOGRAPHICAL ERRORS. THIS AD SUPERCEDES ALL PREVIOUS ADS.

ded Y				RD 6	BUSINE WA 1872 Terz 0) 423 5886 IN	REH 0 Ox
	Addres	Please prir		tate	Zip.	P
20000	ΙĒ					F
			heck or M	.0.	Allow 2 w	

JTSID	E CA CAI	LL TOLL FREE	1 (800) 423-5886 IN	O Oxnaro ana CA CA (213) 9	
me (P dress V	lease prin	st)Stat	e Zip		_
•	Make	Model	Description	Price	Total
	_				

Telex: 182852 Answer: MICKO TZNA California residents add 6% sales tax \*Add 3% Shipping & Handling — Add % surcharge for credit cards. Orders annot be shipped unless accompanied y payment, including shipping, handling and tax where applicable.

OTAL ORDERS AX IF APPLICABLE\* HIPPING & HANDLING TAL ENCLOSED \$

VISA



MAXELL - DYSAN - EPSON - CCS - SHARP - CASIO - HP - VERBATIM - MEMOREX - SOROC - CORVUS - PERSONAL SOFTWARE - CCS

CREDIT CARD #

Exp. Date

### Circle 263 on inquiry card.

10"Art of Computer Programming - Fund. Alg. Vol I\Knuth, D.E.\1968" 20"Z80 Software Gournet Guide & Cookbook\Wadsworth, N.\1979" 30"Basic with Style\Nagin, P, Ledgard, H\1978"

**Listing 3:** A sample run of the MAIN program in the Article/Book Maintenance System. Underscored items are entries made by the user. The dialogue causes the system to create a new master file, sort it, and list it on the printer.

### SAMPLE MAIN

TYPE 'HELP' IN RESPONSE TO 'COMMAND:' IF YOU NEED DETAILED INSTRUCTION.
TO CANCEL ANY COMMAND JUST TYPE A 'RETURN' TO ANY INPUT REQUEST.

DATE: 01/05/81TIME: 13:00COMMAND: SORT

MASTER FILE NAME: MASTER

MASTER FILE DOESN'T EXIST. IS THIS OKAY (Y/N)? Y

PROCESS UPDATE FILE (Y/N)? Y UPDATE FILE NAME: UPDATE1

SORT BY TITLE, AUTHOR OR DATE (T/A/D)? T

COMMAND: LIST

MASTER FILE NAME: MASTER

MASTER FILE DOESN'T EXIST. IS THIS OKAY (Y/N)? Y

EACH PRINT LINE WILL CONTAIN THE TITLE, AUTHOR AND DATE.

PLEASE SPECIFY THE ORDER TO PRINT.

ENTER 'T' FOR TITLE, 'A' FOR AUTHOR AND 'D' FOR DATE.

FIRST ONE: T SECOND ONE: A THIRD ONE: D COMMAND: QUIT

... EXECUTING... UPDATE / SORT PROGRAM

... EXECUTING...LIST PROGRAM

-----Output on the printer:

ARTICLE/BOOK LIST 01/05/81 13:00 PAGE 1

TITLE AUTHOR DATE

Art of Computer Programming - Fund. Alg. Vol I Knuth, D.E. 1968
Basic with Style Nagin, P, Ledgard, H 1978
Z80 Software Gourmet Guide & Cookbook Wadsworth, N. 1979

# SUPERFILE

### **SOLVES YOUR FILING PROBLEMS**

### SUPERFILE makes your information files an ASSET!

Menu driven

Customize program included

CLIENT RECORDS
SALES LEADS
CORRESPONDENCE
JOURNAL ABSTRACTS
PERSONNEL RECORDS
MAILING LISTS
CARD FILES
LEGAL CONTRACTS

Learn in minutes

Ready to run Demo data base included

The USERS MANUAL tells you how to use SUPERFILE to index and retrieve information for these and other practical uses.

**ALMOST ANYTHING!** 

### IF YOU CAN TYPE, YOU CAN TEACH YOURSELF TO USE SUPERFILE IN MINUTES.

### You Need

Computer with Z-80® cpu and at least 48K memory

CP/M® operating system

2 or more floppy disk drives or hard disk

### **Disk Formats**

8" single density 5" including: Osborne, Xerox, North Star, Intertec, Apple (cp/m), Vector.

### Where

Your Dealer Call FYI, INC. Write FYI, INC. Reader Service # **Technical Specifications** 

SEARCH SPEED: 100 records per second\*
RECORD ENTRY: your own text processor or
easily convert your present files

# RECORDS PER DATA BASE: max. 8,000 on 8" SD (depends on disk capacity)
RECORD LENGTH: variable to 512,000 char.
(free format - no fixed length fields)
# KEY WORDS PER SEARCH: max. 64 using

# KEY WORDS PER SEARCH: max. 64 using "and", "or" & "not" # KEY WORDS PER DATA BASE: max. 3,000

# KEY WORDS PER DATA BASE. Ind. 3,000 alpha-numeric plus 32,000 integers
# KEY WORDS PER RECORD: max. 250
KEY WORD LENGTH: max. 64 char. each
# FILES PER DATA BASE: no limit
FILE SIZE: max. 512,000 bytes
SORT: alpha-numeric by record
MERGE and/or SPLIT: records and files

SUPERFILE costs only \$195 (including DEMO data base and manual) (30 day money back guarantee)

MANUAL only: \$50 (applies to purchase)

Special Dealer DEMO free, on request from qualified Dealers and OEM's.

SUPERFILE (TM) trademark of FYI, INC. Z-80° registered trademark of Zilog CP/M° registered trademark of Digital Research \* Using Z-80, 4mhz, 8" DD, av. 10 keywords/record.

Please add \$10 outside the US, Canada, Mexico

### FYI, INC.

P.O. BOX 10998 #615 AUSTIN, TX. 78766

MC/VISA (800) 531-5033 Inside Texas (512) 346-0133

IT'S WHAT YOU CAN FIND THAT COUNTS!

Circle 177 on inquiry card.

MAY SPECIAL SALE ON PREPAID ORDERS WAMECO CRT-1 INTRODUCTION (AT LAST) 16 X 80 OR 24 X 80 VIDEO BOARD I/O MAPPED SIMULATES INTELLIGENT TERMINAL PCBD......\$36.95, KIT.....\$239.95 A & T .....\$299.95

CALIFORNIA COMPUTER SYSTEMS

\$100	
2032 32K STATIC RAM A & T 200 NSEC	\$629.00
2065 64K DYNAMIC RAM A & T	\$548.95
2200 S-100 MAIN FRAM A & T	\$379.95
2422 FLOPPY DISC WITH CP/M 2.2"	\$329.95
2810A Z80 CPU A & T	\$249.95
2710A 4 SERIAL 1/0 A & T.	\$291.95
2718A 2 SERIAL, 2 PARALLEL A & T	\$305.95
2720A 4 PARALLEL A & T	\$214.95
PROTO BOARDS WW	\$39.95
APPLE PRODUCTS	
7114A 12K ROM/PROM	\$68.50
7424A CALENDAR/CLOCK.	\$106.95
7440A PROGRAMMABLE TIMER.	\$98.50
7470A A TO O CONVERTER	\$105.95
7490A GPIB (IE 488) INTERFACE	
7710A ASYNC SERIAL	. \$125.95
7712A SYNC SERIAL	. \$153.95
7720A PARALLEL STANDARD	
7720B PARALLEL CENTRONICS	\$98.95
78118 ARITHMETIC PROCESSOR W/DISC.	. \$342.95
7811C ARITHMETIC PROCESSOR W/ROM	\$342.95
7500A WW BOARD	\$22.95
7510A SOLDERTAIL BOARD	
sen	

### MICROCOMPUTER PRODUCTS S100 PRODUCTS

<b>CB-2</b> 280 PROCESSOR BOARD. KIT\$198.95, A & T\$269.95
<b>VBIC</b> 64 x 16 VIDEO, PCBD \$32.95 KIT \$153.95, A & T \$199.95
<b>VB3</b> 80 CHARACTER VIDEO 4MHZ. KIT\$345.95, A & T\$425.95
104 2 PARALLEL 2 SERIAL PCBD . \$32.95 KIT . \$155.95, A & T . \$194.95
<b>PB-1</b> 2708, 2716 PROGRAMMER BOARD. KIT
ARRIE REGELECTO

### APPLE PRODUCTS AIO SERIAL/PARALLEL INTERFACE. A & T......\$155.95 ASIO SERIAL I/O APIO PARALLEL IO W/O CABLES A & T.....

### WMC inc. WAMECO INC. BOARDS WITH MIKOS PARTS

MEM-3 32K STATIC RAM, PCBD. KIT LESS RAM \$95.95, A & T.	
CPU-2 Z80 PROCESSOR, PCBD. KIT LESS ROM. \$109.95. A & T.	
EPM-2 16K/32K EPROM, PCBD KIT LESS ROM\$65.95, A & T	\$32.95 \$99.95
FPB-1 FRONT PANEL, PCBD	\$48.50 \$184.95
QMB-12 13 SLOT MOTHER BOARD, PCBD. KIT\$95.95, A & T	\$39.95

MONDAY-FRIDAY, 8:00 TO 12:00, 1:00 TO 5:30 THURSDAYS, 8:00 TO 9:00 P.M

(415) 728-9121 P.O. BOX 955 • EL GRANADA, CA 94018

PLEASE SEND FOR IC. XISTOR AND COMPUTER PARTS LIST VISA or MASTERCHARGE. Send account number, interbank number. expiration date and sign your order. Approx. postage will be added Orders with check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day quarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. \$20.00 minimum order. \$2.00 service charge on orders less than \$20.00.

%!ICL, and application-program files have names prefixed with %! (restricting the name to six characters).

### Flow of Execution

Figure 3 shows the flow of execution of the Article/Book Maintenance System. The MAIN program executes first, then shifts to the subexecutive. The subexecutive determines whether the job is at an end. If not, the subexecutive determines, based on data from the job-control file, the next program to execute-whether %!SORT or %!LIST. Either the sort or the list program CHAINs to the subexecutive.

The MAIN Program

Listing 6 is the MAIN program. MAIN contains remarks identifying the functions and variables used. I'll comment on MAIN from beginning to end, with emphasis on use of the utility routines. I gave the utility routines line numbers from 64000 to 65040; this numbering should make it easy for you to use the delete and append features of BASIC to separate the utility routines and use them for another application. Now for the comments, by line number.

170-200 Drive Determination. A search determines the disk drive on which the Article/Book Maintenance System is located. This eliminates the need to specify the drive when running MAIN.

290-400 Command Interpretation. This block of code starts by determining the command. Line 300 calls a utility routine at line 64990 to check for null input, MAIN calls this routine to handle input throughout the program. The GOTOs on line 370 correspond to the functions defined in the DATA statement on line 100. In this case, 1000 is HELP, 2000 is QUIT, 3000 is SORT, and 4000 is LIST. The command-processing routine matches each character in the input string with each character in the commands defined in the DATA statement at 100. This permits the user to enter short forms for each command (H, Q, S, and L) and still identify the desired function in a unique manner.

1000-1130 HELP-Command Processing. These lines display the available commands as they were defined in the DATA statement at line 100.

2000-2030 OUIT-Command Processing. These lines close the job-control file and call the subexecutive.

3000-3500 SORT-Command Processing. Lines 3010-3030 start a new entry in the job-control file. The GOSUB 64260 goes to the utility routine that saves the name of the program to be executed. Line 3050 transfers control to the routine at 64460, which will add a descriptive phrase for the program to be executed. Lines 3070 and 3080 call utility routines to process

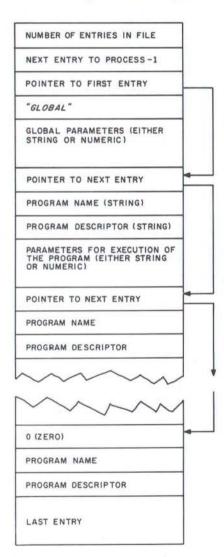
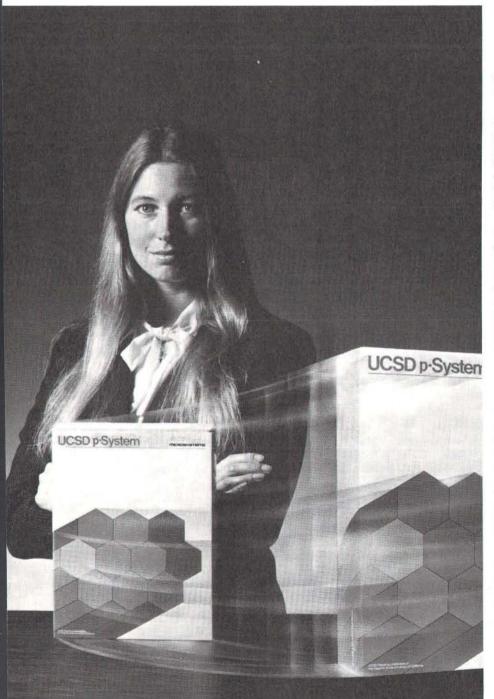


Figure 2: The structure of the job-control file. The file contains "global" parameters—parameters needed by more than one program in the Article/Book Maintenance System—and the parameters that determine which program is executed next.

# "Without touching your program I can move it to and from Z80, LSI-11," 8086, 6502, 8080, 6809, 68000 and 9900-based computers."

JULIE ERWIN, Vice President, Marketing, Sof Tech Microsystems, Inc.



UCSD p-System and UCSD Pascal are trademarks of the Regents of the University of California. LSI-II is a trademark of Digital Equipment Corporation. XenoFile is a trademark of SofTech Microsystems, Inc. CP/M is a registered trademark of Digital Research, Inc. Apple is a registered trademark of Apple Computer, Inc.

You can do it too, with SofTech Microsystems' unique software development and execution environment, the UCSD p-System<sup>TM</sup>.

Our UCSD p-System is the only genuinely machine-independent operating system for 8-bit and 16-bit microcomputers. And to over 50,000 end-users and scores of applications developers it is the one proven, reliable answer to software obsolescence.

For software development, it allows you to work in any combination of UCSD Pascal<sup>TM</sup>, FORTRAN-77, BASIC, and assembly language. It provides support for dynamic memory management and multitasking, with a full arsenal of powerful enhancements, such as a versatile Screen Editor, Native Code Generators, a Print Spooler, TURTLEGRAPHICS and XenoFile<sup>TM</sup>, for easy access to CP/M® disks and files.

Users report that our UCSD p-System's friendly, fast and compact execution environment makes it their first choice in software. So whether you're buying or developing software for your IBM, Apple®, Tandy, Commodore, Texas Instruments, Philips or any other small computer, your best move is to our UCSD p-System. Nothing else touches it.

Our UCSD p-System is available for distribution licensing as well as single copy purchase. Visa and MasterCard orders are welcome, or you may write to us for more details.



9494 Black Mountain Road, San Diego, CA 92126. (714) 578-6105 TWX: 910-335-1594 with software purchase

CP/M®

ARTIFICIAL INTELLIGENCE

### ULTIMATE SOFTWARE PL

ORGANIC SOFTWARE

We'll match any advertised price on any item that we carry. And if you find a lower price on what you bought within 30 days of buying it, just show us the ad and we'll refund the difference. It's that simple.

Combine our price protection with the availability of full professional support and our automatic update service and you have the Ultimate Software Plan.

It's a convenient, uncomplicated, logical way to get your software.

specify disk systems and formats. Most formats available.

(New items or new prices) \* Special price of the month.

DISK WITH / MANUAL MANUAL ONLY

Dental (PAS-3)	\$849/\$40	D
ASYST DESIGN® Prof Time Accounting	\$540/\$40	N
General Subroutine	\$269/\$40	C
Application Utilities	\$439/\$40	G
COMPLETE BUS. SYS		A
*Creator		A
*Reporter	\$129/\$20	Ä
*Both	\$299/\$45	E
COMPUTER CONTRO	L*	Р
*Fabs (B-tree)	\$119/\$20	G
*UltraSort II		Ã
COMPUTER PATHWAY	/S**	A
Pearl (level 1)		P
Pearl (level 2).	\$299/\$40	Ir
Pearl (level 3)		S
DIGITAL RESEARCH®		C
CP/M 2.2 NorthStar	£140/£25	P
TRS-80 Model II	\$149/\$25	N
(DAT)	\$159/\$35	C
Micropolis	\$169/\$25	S
PL/I-80	\$459/\$35	* A
BT-80	\$179/\$30	* B
Mac	\$ 85/\$15	
Sid. Z-Sid	\$ 65/\$15	S
Tex	\$ 90/\$15	- N
DeSpool	\$ 50/\$10	· V
CB-80	\$459/\$35	S
CBasic-2	\$ 98/\$20	В
D.M.A.		C
Ascom	\$149/\$15	S
Formula	\$539/\$45	S
GRAHAM-DORIAN"		T
General Ledger	\$729/\$40	A
Acct Receivable	\$729/\$40	T
Acct Payable	\$729/\$40	G
Job Costing Payroll II	\$729/\$40	A
Inventory II	\$729/\$40	C
Payroll	\$493/\$40	
Inventory	\$493/\$40	S
Cash Register	\$493/\$40	0
Apartment Mgt.	\$493/\$40	D
MICRO-AP®	20.552	Ĕ
S-Basic	\$269/\$25	F
Selector IV	\$295/\$35	E
Selector V	\$495/\$50	C

MICRO DATA BASE SYSTEMS

WordStar/ Mail-Merge \$109/\$25
WordStar/ Mail-Merge \$419/\$85
DataStar \$249/\$60
WordMaster \$119/\$40

MDBS DRS or QRS or RTL MDBS PKG

MICROPRO\* WordStar Customization Notes

SuperSort I

MICROSOFT®

Basic Compiler

MuSimp/MuMath MuLisp-80 Multi Plan

Multi Plan Manager Series

Fortran-80

Cobol-80

M-Sort Macro-80

Edit-80

Spell Star

CalcStar

\$269/\$35 \$795/\$40

\$199/\$40

\$175/\$40

\$259/\$na

\$349

\$629

\$ 84

\$224 \$174

Call

TextWriter III. DateBook II. Milestone	\$111/\$25 \$269/\$25 \$269/\$30
OSBORNE* General Ledger Acct Rec/Acct Pay Payroll w/Cost All 3 All 3 + CBASIC-2 Enhanced Osborne	\$ 59/\$20 \$ 59/\$20 \$ 59/\$20 \$ 129/\$60 \$ 199/\$75 \$ 269/\$60
PEACHTREE® General Ledger Acct Receivable Acct Payable Payroll. Inventory Surveyor Property Mgt CPA Client Write-up P5 Version MagiCalc Other	\$399/\$40 \$399/\$40 \$399/\$40 \$399/\$40 \$399/\$40 \$399/\$40 \$799/\$40 \$799/\$40 Add \$129 \$269/\$25 less 10%
*Adapt (CDOS to CP/M) *Ratfor	\$ 49/\$na \$ 68/\$na
*MatchMaker *WorkSheet	\$ 89/\$20 \$159/\$20
STRUCTURED SYSTE Business Packages, Call for Price	
SORCIM* SuperCalc Trans 86 Act	\$115
Act TCS* GL or AR or AP or Pay. All 4 Compiled each Inventory.	\$ 79/\$25
SUPERSOFT® Diagnostic I Diagnostic II Disk Doctor Forth (8080 or Z80) Fortran Fortran w/Ratfor C Compiler Star Edit Other	\$ 49/\$20 \$ 84/\$20 \$ 84/\$20 \$ 149/\$30 \$219/\$30 \$289/\$35 \$174/\$20 \$189/\$30
UNICORN® Mince Scribble Both	\$149/\$25
WHITESMITHS* "C" Compiler	\$600/\$30
"PASCAL" Pascal/MT+ Pkg Compiler Sp Prog Pascal/Z Pascal/UCSD 4.0 Pascal/M "DATA BASE"	\$429/\$30 \$315 \$175 \$349/\$30 \$670/\$50 \$355/\$20
FMS-80 dBASE II Condor II	\$649/\$45 \$595/\$50 \$899/\$50

Magic Spell Spell Binder Select The Word	\$349/\$45 \$495/\$na
"OTHER GOODIES" Micro Plan Plan 80 Target BSTAM BSTMS Tiny "C" Tiny "C" Compiler Nevada Cobol MicroStat Vedit MinIModel StatPak Micro B+ Raid String/80 String/80 (source) ISIS CP/M Utility Lynx Supervyz CP/M Power Mathe Magic	\$419/\$na \$269/\$30 \$189/\$30 \$149/\$na \$149/\$na \$29/\$50 \$179/\$25 \$130/\$15 \$449/\$40 \$229/\$20 \$224/\$35 \$449/\$40 \$229/\$20 \$224/\$35 \$449/\$40 \$29/\$20 \$25/\$199/\$20 \$25/\$199/\$20 \$25/\$199/\$20
APPLE II®	St. Art

%
%
%
%
%
%
40
40

### **IBM PC SOFTWARE**

Business/Med/WP Call for Price

8086 SOFTWARE	
CBASIC 86	\$300/\$ni
✓ Pascal MT + 86 Pkg.	\$730/\$n
Pascal UCSD 86	. \$700/\$n
Macro 86	\$259/\$0

ORDERS ONLY-CALL TOLL FREE VISA · MASTERCHARGE

WORD PROCESSING

WordSearch SpellGuard

Magic Wand

SpellGu VTS/80

1-800-854-2003 ext. 823 · Calif. 1-800-522-1500 ext. 823

Outside Continental U.S.—add \$10 plus Air Parcel Post • Add \$3.50 postage and handling per each item • California residents add 6% sales tax • Allow 2 weeks on checks, C.O.D. \$3.00 extra • Prices subject to change without notice. All items subject to availability • ®—Mfgs. Trademark. Blue Label \$3.00 additional per item.

THE DISCOUNT SOFTWARE GROUP

\$179/\$50 \$229/\$25

\$289/\$45

6520 Selma Ave. Suite 309 · Los Angeles, Ca. 90028 · (213) 837-5141 Int'l TELEX 499-0446 DISCSOFT LSA • USA TELEX 194-634 (Attn: 499-0446) TWX 910-321-3597 (Attn: 499-0446)

file-name inputs. Two additional utility routines, found at lines 64460 and 64360, are called to process string and numeric values respectively. Whenever the routine at line 64990 is called to check for null input (e.g., line 3110), the jump for null value indicated on the next statement (e.g., line 3120) goes to 65050 to reset the pointers for starting the entry over. To complete command processing, line 3490 calls the routine at 64150 to update the pointers in the job-control file.

4000-4570 LIST-Command Processing. Setting up an entry in the jobcontrol file requires the same kind of processing required in the SORT command. The first and last lines of the code for each command that adds an entry to the job-control file are the same, as shown here:

P1 = P

(start of command processing)

Text continued on page 366

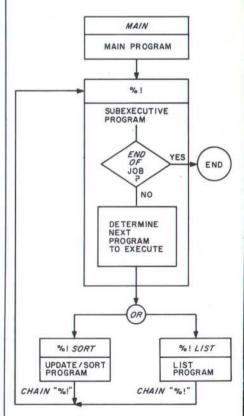


Figure 3: A diagram of control flow in the Article/Book Maintenance System. The main program executes first and calls the subexecutive. Based on data from the jobcontrol file, the subexecutive determines which program executes next.

### STOP SOFTWARE FAILURES

Using a micro in a product <u>sounds</u> easy...
One piece of software can make the difference between success and failure.

What do you do when the software doesn't work? Over the years, we have seen many good products fail, either before or after they reached the market, because the microprocessor software did not do its job.

### WHAT WENT WRONG?

Many of the failures occurred because the people programming the micro did not know how to organize a large control program. Those responsible for the product implementation were wizards at hardware design and had easily coded small micro control programs before. But the programming techniques that worked for less than 2K bytes of code simply fell apart as the program grew beyond 4K bytes.

Unfortunately, the loops and tests and flags that work so well for a small program get out of control very rapidly as the program grows. Pretty soon, some of the things the program must do are not being done fast enough. The code gets too complicated, difficult to modify and unreliable. The result: another software failure!

Fortunately, these problems can be avoided by using a program manager. You can divide your complex control program into a number of separate, more manageable programs, called *tasks*, each designed to do one job. For example, a Keyboard Task might handle user input; a Printer Task might generate reports. Each task can be written and tested separately and then combined to form a reliable, finished system.

The program manager, called a multitasking executive, supervises the orderly execution of these tasks, assuring that the most important jobs always get done first. Tasks appear to be executing simultaneously. It's almost like having a separate CPU for each task! That is why professional software designers are now turning to AMX as the starting point for their product and system designs. They know that AMX will shield them from the difficulties of managing the micro, freeing them to concentrate on their application.



AMX is our **multitasking executive** for the 8080, 8085, Z80 and 6809 processors. We're rather proud of it. We made AMX compact, very fast, and ROMable to meet our own application needs. Even though the AMX nucleus is less than 1400 bytes in size, it features multiple task priorities, intertask message passing with priority queuing, external event synchronization, and interval timing with 32-bit precision. Each feature is clearly explained in the AMX Reference Manual.

### **RELIABILITY BUILT IN**

We don't know anyone who can write an executive without errors, so we thoroughly tested AMX in real applications before ever offering it as a product. That is why not one system malfunction has ever been attributed to AMX. That kind of reliability just isn't an accident.

### **HARDWARE INDEPENDENCE**

AMX does not require a particular hardware configuration. Of course, it does need a microprocessor, but even there we offer you a choice. You control your environment. You pick the I/O method. You decide the most optimum interrupt service technique for your system. AMX will support your choice.

High level language interface modules are available separately to allow AMX to be used with most popular programming languages including PASCAL, C, PL/M and FORTRAN. Of course, you can also code in assembly language if required.

Users of the CP/M and FLEX Operating Systems can utilize our AMX interface modules to access information on diskette in real time.

### **COMPLETE DOCUMENTATION**

AMX can be judged by the quality of our documentation. The positive response from our users has exceeded our expectations. Our manuals are especially valuable to those just being introduced to real-time multitasking. More experienced users will appreciate the fact that we deliver AMX source on diskette to permit AMX to be moved to the software development system of your choice.

### **HOW TO ORDER**

A specification sheet and price list are available, free. Your check or money order for \$75 will purchase the AMX Reference Manual for immediate evaluation (specify 8080, 8085, Z80 or 6809 processor). Add \$25 for postage and handling outside USA and Canada. The standard AMX Multitasking Executive package, including source code, is available for \$800 after signing our liberal license agreement.

AMX is the choice of professionals the world over. Make it yours, today.



### KADAK Products Ltd.

1847 West Broadway Avenue Vancouver, B.C., Canada V6J 1Y5 Telephone (604) 734-2796 Telex 04-55670 **Listing 4:** The update file UPDATE2. Line 20 deletes an old entry and replaces it with the data in line 30. The dialogue in listing 5 shows how the Article/Book Maintenance System incorporates UPDATE2 in a new master file.

```
10"Pascal - User Manual & Report\Jensen, K, Wirth, N\1974"
20-"Basic with Style\\"
30"Basic with Style - Programming Proverbs\Nagin, P, Ledgard, H\1978"
```

**Listing 5:** A second sample run of the MAIN program in the Article/Book Maintenance System. Underscored items are entries made by the user. The dialogue causes the system to update the master file, sort and list it by title, then sort and list it by author. Both sets of sorted data appear at the end of the listing.

TYPE 'HELP' IN RESPONSE TO 'COMMAND: IF YOU NEED DETAILED INSTRUCTIONS.

TO CANCEL ANY COMMAND JUST TYPE A 'RETURN' TO ANY INPUT REQUEST.

### DATE: 01/06/81 TIME: 09:00 COMMAND: SORT MASTER FILE NAME: MASTER PROCESS UPDATE FILE (Y/N)? Y UPDATE FILE NAME: UPDATE2 SORT BY TITLE, AUTHOR OR DATE (T/A/D)? T COMMAND: LIST MASTER FILE NAME: MASTER EACH PRINT LINE WILL CONTAIN THE TITLE, AUTHOR & DATE. PLEASE SPECIFY THE ORDER TO PRINT. ENTER 'T' FOR TITLE, 'A' FOR AUTHOR AND 'D' FOR DATE. FIRST ONE? T SECOND ONE? A THIRD ONE? D COMMAND: SORT

EACH PRINT LINE WILL CONTAIN THE TITLE, AUTHOR AND DATE.

ENTER 'T' FOR TITLE, 'A' FOR AUTHOR AND 'D' FOR DATE.

MASTER FILE NAME: MASTER PROCESS UPDATE FILE (Y/N)? N

MASTER FILE NAME: MASTER

COMMAND: LIST

FIRST ONE? A
SECOND ONE? T
THIRD ONE? D
COMMAND: QUIT

SORT BY TITLE, AUTHOR OR DATE (T/A/D)? A

PLEASE SPECIFY THE ORDER TO PRINT.

... EXECUTING... UPDATE / SORT PROGRAM

... EXECUTING... UPDATE/SORT PROGRAM

... EXECUTING...LIST PROGRAM

... EXECUTING...LIST PROGRAM

SAMPLE MAIN

## DUAL/68000



A new and powerful computer has been born...
the System 83. The versatile UNIX\* operating system
pilots the System 83's raw power through a myriad of
software such as "C", FORTRAN, PASCAL, BASIC,
COBOL, and even Networking. Step into
a bold new frontier with more
power than you ever
dreamed possible.

### **FEATURES:**

- ☐ UNIX V7 configured by UNISOFT\*\*
- ☐ Full IEEE 696/S-100 Compatability
- ☐ MC68000 8Mhz Processor
- ☐ 32-Bit Data Operations with 32-Bit Internal Registers
- ☐ 16-Bit Data Transfer Operations
- ☐ Memory Management Allows Concurrent Use of Mapped and Non-mapped Address space
- ☐ Rugged Industrial Grade Components at all Levels
- ☐ 16 Mb of Main Memory Directly Addressable
- ☐ 7 Vectored Interrupt Levels
- ☐ 192 Device-supplied Interrupts
- ☐ 256 Kb of RAM with Parity Per Board Slot
- ☐ Up to 3.2 Mb of RAM Per Cabinet
- \* UNIX is a trademark of Bell Laboratories and is supported on the DUAL System 83 by UNISOFT
- \*\*UNISOFT is a trademark of UNISOFT Corporation of Berkeley, CA.

Circle 146 on inquiry card.

**DUAL SYSTEMS CONTROL CORPORATION** 

the same

system reliability/system integrity



O Chamila Way & Barbalay & CA 04710 & /415) 540 2054 & Talay : 172020 SBV

-----Output on the printer:

ARTICLE/BOOK LIST 01/06/81 09:00 PAGE 1

TITLE AUTHOR DATE

Art of Computer Programming - Fund. Alg. Vol I Knuth, D.E. 1968 Nagin, P, Ledgard, H 1978 Basic with Style - Programming Proverbs

Pascal - User Manual & Report Jensen, K, Wirth, N 1974

1979 Z80 Software Gourmet Guide & Cookbook Wadsworth, N.

01/06/81 09:00 ARTICLE/BOOK LIST PAGE 1 DATE AUTHOR TITLE Jensen, K, Wirth, N Pascal - User Manual & Report 1974 Knuth, D.E. Art of Computer Programming - Fund. Alg. Vol I 1968 Nagin, P. Ledgard, H Basic with Style - Programming Proverbs 1978 Wadsworth, N. Z80 Software Courmet Guide & Cookbook 1979

### YOU'VE NEVER SEEN DISCOUNTS LIKE THESE!

CROMEMCO



SYSTEM ONE **\$2999** SYSTEM 1H

5395

VIDEO TERMINAL \$2099 3102



SYSTEM TWO \$3995 SYSTEM Z2H 7495



SYSTEM THREE \$5999 NEW CROMEMCO PRODUCTS

. . .

8 and 16 BIT DUAL PROCESSORS

CSID2E (256K RAM) \$4299 CSID5E(512K RAM) 4999 CSIHD2E (256K, 5 Meg. H.D.) 5999 CS3D5E(512K RAM) 7299

CS3HD40E (5 Meg. H.D., 4 Meg. RAM)

**MAXELL DISKETTES Boxes of 10** 

\$39,95 FD 1 MD 1 \$42.95 MD2 FD 2 57.95 49.95

MORE SPECIALS

\$ 699 ATARI 800 EPSON MX80 S 499 TI 810 Printer 1349 EPSON MX80 FT 599 **EPSON MX100** OANTEX Printer 1049 759 ADDS Viewpoint 599 **SOROC 10130** ADDS Regent 25 879 DEC LA34

CALL FOR INFORMATION ON NORTHSTAR, HAZELTINE, LEAR-SIEGLER, QUME, INTEGRAL DATA SYSTEMS, OKIDATA, TELEVIDEO, **DIGITAL MICRO SYSTEMS** 

All prices are CASH. American Express, Visa, Master Card, add 5% Prices subject to change without notice

20995

P.O. BOX 233, Greenvale, New York 11548

PHONE ORDERS CALL 516-869-8537

# Now NRI takes you inside the new TRS-80 Model III microcomputer to train you at home as the new breed of computer specialist!

NRI teams up with Radio Shack advanced technology to teach you how to use, program and service state-of-the-art microcomputers...

It's no longer enough to be just a programmer or a technician. With microcomputers moving into the fabric of our lives (over 250,000 of the TRS-80™ alone have been sold), interdisciplinary skills are demanded. And NRI can prepare you with the first course of its kind, covering the complete world of the microcomputer.

### Learn At Home in Your Spare Time

With NRI training, the programmer gains practical knowledge of hardware, enabling him to design simpler, more effective programs. And, with advanced programming skills, the technician can test and debug systems quickly and easily.

Only NRI gives you both kinds of training with the convenience of home



Training includes new TRS-80 Model III microcomputer, 6-function LCD Beckman multimeter, and the NRI Discovery Lab with hundreds of tests and experiments.

(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

study. No classroom pressures, no night school, no gasoline wasted. You learn at your convenience, at your own pace. Yet you're always backed by the NRI staff and your instructor, answering questions, giving you guidance, and available for special help if you need it.

### You Get Your Own Computer to Learn On and Keep

NRI training is hands-on training, with practical experiments and demonstrations as the very foundation of your knowledge. You don't just program your

computer, you go inside it...watch how circuits interact...interface with other systems ...gain a real insight into its nature.

You also work
with an advanced liquid
crystal display handheld multimeter and
the NRI Discovery Lab,
performing over 60
separate experiments.
You learn troubleshooting procedures and gain
greater understanding
of the information.
Both microcomputer
and equipment come as
part of your training for
you to use and keep.

### Send Or Call For Your Free Catalog...

You'll get all the details in NRI's FREE, 100-page catalog. It will show you all the equipment, lesson outlines and facts on other electronic courses, including Communications Electronics, TV/ Audio/Video, Electronic Design and more. Send coupon below or phone right now using our TOLL-FREE number 1-800-323-1717, at no expense to you. If coupon is missing, write NRI Schools, 3939 Wisconsin Avenue, Washington, DC 20016.

MAIL COUPON OR CALL TOLL-FREE 1-800-323-1717 Ask for Operator 52 (In Illinois, phone 1-800-942-8881)



### NRI Schools

McGraw-Hill Continuing Education Center 3939 Wisconsin Avenue Washington, D.C. 20016 We'll give you tomorrow.

### CHECK ONE FREE CATALOG ONLY NO SALESMAN WILL CALL ON YOU

- □ Computer Electronics including Microcomputers
- ☐ Color TV, Audio, and Video System Servicing
- □ Electronics Design Technology
   □ Digital Electronics
- □ Digital Electronics
   □ Communications Electronics FCC
   □ Licenses Mobile CB Aircraft Marine
- ☐ Industrial Electronics
- ☐ Basic Electronics☐ Small Engine Servicing
- ☐ Appliance Servicing
- ☐ Automotive Servicing
  ☐ Auto Air Conditioning
- ☐ Air Conditioning, Heating, Refrigeration, & Solar Technology ☐ Building Construction

All career courses

approved under GI bill

☐ Check for details

Name (Please Print) Age
Street

, acc

Accredited by the Accrediting Commission of the National Home Study Council

170-052

Listing 6: The MAIN program in the Article/Book Maintenance System. This program is the executive that manages the other programs. It handles all interaction with the user and sets up a job-control file. MAIN repeatedly calls the utility subroutines found at lines 64000 through 65040.

- 10 REM\* MAIN EXECUTIVE (SAVED IN FILE "MAIN") 20 REM\* 12/16/80 WRITTEN BY GENE F. WALTERS 30 REM\* SET UP PARAMETERS 40 DIM V\$(80) 50 D1=0 \REM DEVICE FOR CONSOLE 60 D3=0 \REM DISK FILE FOR THE SYSTEM 70 U=3 \REM NO. OF DRIVES IN SYSTEM 80 L1=5 \REM NO. OF BYTES FOR NUMERIC VALUES 90 L2=2 \REM NO. OF BYTES OF OVERHEAD FOR A STRING < 256 CHAR 100 DATA "HELP", "QUIT", "SORT", "LIST" \REM AVAILABLE COMMANDS 110 N9=4 \REM NO. OF COMMANDS THAT CAN BE EXECUTED 120 N=0 \REM NO. OF COMMANDS IN JOB CONTROL FILE 130 B=5 \REM NO. OF BLOCKS FOR JOB CONTROL FILE 140 P=L1+L1 \REM POSITION OF NEXT AVAILABLE BYTE IN JOB CONTROL FILE 150 S\$="%!" \REM PREFIX FOR SYSTEM FILE NAMES 160 GOSUB 64520 \REM SIGN-ON MESSAGE 170 FOR I=1 TO U 180 U\$=CHR\$(I+48) 190 IF FILE(S\$+","+U\$)=2 THEN EXIT 220 200 NEXT I 210 PRINT #D1, "COULDN'T FIND SUBEXECUTIVE FILE [", S\$, "]." \END 220 F\$=S\$+"JCL,"+U\$ 230 IF FILE(F\$)=3 THEN 250 240 CREATE F\$,B 250 OPEN #D3.F\$ 260 WRITE #D3, N, O 270 GOSUB 5000 \REM SET UP GLOBAL PARAMETERS IN JOB CONTROL FILE 280 REM\* INPUT NEXT COMMAND 290 RESTORE \INPUT #D1, "NEXT COMMAND: ", C1\$ 300 I\$=C1\$ \GOSUB 64990 \REM CHECK FOR NULL INPUT 310 ON Z GOTO 320, 290 320 FOR I=1 TO N9 330 READ C2\$ 340 IF LEN(C1\$)>LEN(C2\$) THEN 380 350 IF C1\$<>C2\$(1,LEN(C1\$)) THEN 380 360 N=N+1 370 ON I GOTO 1000, 2000, 3000, 4000 \REM GOTO FOR EACH COMMAND 380 NEXT I 390 PRINT #D1, "INVALID COMMAND!" 400 GOTO 290 1000 REM\* HELP COMMAND 1010 RESTORE 1020 PRINT #D1 1030 PRINT #D1, "COMMANDS AVAILABLE: ", 1040 FOR I=1 TO INT((N9+5)/6)1050 FOR J=1 TO N9-INT(N9/6)\*61060 READ C2S 1070 PRINT #D1,C2\$, 1080 IF (I-1)\*6+J<>N9 THEN PRINT #D1,", ",
  - Listing 6 continued on page 356

1090 NEXT J

1100 PRINT #D1 \PRINT #D1, TAB(20),

### PSON

### PRINTERS & ACCESSORIES

If you buy your EPSON somewhere else you'll probably pay too much!

### Common Features of the MX80, MX80FT & MX100 Printers

- 80 characters per second Replaceable print head by user User programable from BASIC Bi-directional logic seeking printhead 96 ASCII characters Programable tabs (vert./horz.) Cartridge ribbons Self-test mode

- Tractor/pin feed paper flow
  Extreme reliability
  12 type fonts under software control
  9x8 & 9x18 matrix
  Programable form feeds
  Compressed/expanded letters
  Parallel interface standard
  Double strike & emphasized modes

MX80....The Printer that started it all. All of the above features plus extreme ease of use. Complete TRS80 block graphics set as well as user selectable international symbols. Gives correspondence quality printing in several user selectable modes. Dip switch pins may be set for dedicated applications. Complete forms programability from BASIC software.

MX80FT .... All the features of the MX80 but with FRICTION feed as well for the use of single sheets of paper or roll paper. An exceptional buy for the user needing the single sheet capability. In the compressed mode 132 characters can be printed across the width of a page which means it can be used for any printouts that normally need a 15 inch wide printer.

MX100... An exceptional printer with a extra quiet printhead and extra heavy duty construction for the intense use of a business environment. Does not have the TRS80 graphic blocks but comes standard with Bit-Image graphics which allow the user control of individual dots for designing specialized graphs, symbols, etc. A best buy for business use.

MX70....For the budget minded a excellent entry level printer. It has most all of the features mentioned above including Bit-Image graphics in place of the TRS80 graphic blocks set. The Printer is unidirectional only. Expandable text can be printed but not compressed. Only single density printings is supported on the MX70. An inexpensive heavy duty printer.

**BEST** prices on Epson Printers All Printers & accessories in STOCK now!!!

### EPSON ACCESSORIES, INTERFACES & CABLES

GRAPHTRAX 80 option (bit-image/italics).\$79 CABLE Model | intertace & Model III ... \$35

\$25 if purchased with EPSON printer CABLE & INTERFACE to Model I keyboard..\$85 APPLE interface & cable. GRAPPLER Apple hi resolution graphics..\$Call IEEE interface & cable (CBM/Pet)......\$79 ATARI cable (must have 850 interface).... SERIAL RS232 2k buffered int. card.... RS COLOR computer to Epson card/cable..\$59

RIBBONS AND CARTRIDGES IN STOCK NOW

800-433-5184 **\$CALL** 

### **EPSON PACK 2 - GRAFTRAX**

erson PACK 2 - GRAFTRAX version for MX80, 80FT & MX100. This package includes updated versions of modules in original Epson Pack. A screen oriented BIT IMAGE GRAPHICS generator utility is provided. Create your special characters, symbols, etc. directly on your monitor and then send to printer. Printout includes code to generate graphics and will save needed code as BASIC program line to disk. Then MERGE these into your BASIC program. Also demo programs showing use of Bit-Image graphics. Full documentation. INTRO SPECIAL: 324.95 with printer or GRAFTRAX. \$34.95 separately. \$7.50 for update of old Epson Pack

### **PRINTERS**

### **MATRIX PRINTERS**

EPSON MX70 EPSON MX80	\$CALL
EPSON MX80 FT	\$CALL
EPSON MX100 FT	\$CALL
LINE PRINTER VII RS	\$325
NEC 8023A	\$495
C. ITOH 8510	\$495
OKIDATA 82A	\$499
OKIDATA 82A w/tractor	\$559
OKIDATA 83A	\$769
LINE PRINTER VIII RS	\$649
<b>CENTRONICS 739parall</b>	el \$599
CENTRONICS 739 serial	
OKIDATA 84/200 cps	\$1295
LINE PRINTER VI RS	\$988
CENTRONICS 704	\$1559
ANADEX 9500/01 2k buf.	\$1295
TEXAS INST. 810 Basic	\$1595
LINE PRINTER V RS	\$1549
Centronics 352 / 200 cps	\$1795
Centronics 353 / dual me	

### super letter quality **LINE PRINTERS**

200cps data proc., 50cps

CENTRONICS 6080/81 600 lines per minute high speed band printer. For serious business applications. 608l standard \$7676 6080 quietized cabinet \$6399

### LETTER QUALITY Daisy Wheel / Spinwriters

C. ITOH F-10/40 cps	\$1595
DAISY WHEEL II RS	\$1695
NEC SPINWRITERS	
3510 RS232	\$1795
3530 Centronics pa'lel	\$1795
7710 Read Only	\$2375
7710 R/O w/tractor	\$2575
7720 kybd w/tractor	\$2750
7730 R/O parallel	\$2375
7730 R/O par.w/tract.	\$2575
DIABLO 630 R/O	\$2350
DIABLO 630 keyboard	\$2850
QUME 9/35 R/O	\$1850
QUME 9/35 keyboard	\$1950
QUME 9/45 limited	\$2295
QUME 9/55 limited	\$2395

Interfaces & cables available for most printers with any TRS80, Apple, Atari & most other computers. \$\$\$\$CALL FOR PRICES!

### HIGH RESOLUTION MONITOR

and the second s	
NEC green monitor	\$179
NEC color monitor	\$349

ALTOS COMPUTERS \$CALL

### TEXAS COMPUTER SYSTEMS

Offers Lowest Prices on



MODEL II 64k..... MODEL II 1 Drive Expansion...\$995 MODEL II 2 Drive Expansion..\$1495 MODEL II 3 Drive Expansion.\$1995 Radio Shack HARD DISK .....\$3995 TCS 1 Drive/single cabinet.....\$849 TCS 1 Drive/triple cabinet.....\$949 TCS 2 Drive/triple cabinet...\$1424 TCS 3 Drive/triple cabinet...\$1899 TCS uses original Shugart drives MODEL 16 1 Drive.....\$4499 MODEL 16 2 Drive.....\$5199 DT-1 DATA TERMINAL.....\$629

### **CORVUS** HARD DISKS

CALL FOR PRICES \$\$\$\$\$

Add 5, 10 or 20 megabytes of storage to your TRS80, Apple, Atari, Heath, Zenith, Intertec, IBM, S-100 and many others. One or several computers can share a hard disk. Get simultaneous access to data for multiple users. Available NOW at SUPER SAVINGS!

DEALERS...You can buy CORVUS from us for less. Call & \$AVE.

### COLOR COMPUTERS

Orginal mfg.warranty on these items: \$308	TCS 180 day Limited warranty on TCS items: 16K Level 1\$369
16K Level 1	16K Extended Basic\$439 32K Extended Basic\$499 32K Upgrade Kit (TCS)\$79 EPSON/COLOR Int.& cable\$59

### MODEL III SYSTEMS The following come with quality TCS

	memory and our own 180 day limited war-
The following with Radio Shack Warranty:	ranty. No warranty when customer opens computer or adds internal components.
Model III 16k \$818	MODEL III 16k TCS\$788
MODEL III TOK WOTO	MODEL III 16K 105\$788
Model III 32k \$918	MODEL III 32k TCS \$818
Model III 48k\$1018	MODEL III 48k TCS\$848
Model III 48k 2 Drives RS232 \$2049	WODEL III TOK TOOMMINGOTO

### MODEL Ш DISK EXPANSION KITS

We use the highest quality fiberglass CONTROLLER BOARDS with double sided glass epoxy board and gold plated contacts in our TCS systems. The finest switching POWER SUPPLY available is also provided. The aluminum MOUNTING HARDWARE has slotted holes for easy installation of the drives and includes all the power and data cables necessary to install the controller, drives and power supply.

Our DISK DRIVES are made by Tandon the same company that makes the drives used by Radio Shack. These drives are 40 track, double density, 5 millisecond stepping rate and are fully burned in for 48 hours. These drives have the same specifications as the drives used by Radio Shack. No soldering or modifications to existing circuitry is necessary. The following kits are available:

KIT 1	Controller, Power Supply & Mounting Hardware\$	379
		595
KIT 3	Controller, Power Supply, Hardware & 2 Disk Drives \$1	819
KIT 4	One Tandon Disk Drive (bare drive only)\$	219
KIT 5	16K of High Quality TCS Memory chips\$	49.95
KIT 6	32k of High Quality TCS Memory chips\$	79.95

MODEL III 48k 2 DISK DRIVES ...

Above KIT fully assembled, with 48 hour burn-in test & 180 day TCS Limited Warranty!!

### CUSTOM SOFTWARE FROM TCS

Completely Integrated BINARY SEARCH TREE programs now available. This series of programs fully implements the B-TREE structures including INSERTION, DELETION, EDITING & TRAVERSAL. No more sorting or long data file searches and yet files can be larger than memory. Duplicate keys are fully supported. Files can be retrieved in sorted order via B-TREE Traversal. Each of the programs come with fully commented source code so that you can use the modules in your own programming.

B-TREE Library (organize your home library keyed by author).....etc...
B-TREE Video (organize your video cassette library, prints labels, etc.).
B-TREE Mailing List (keyed by name or zip,label printing,etc).......

For fast, efficient service. Heart of we can air freight from Dallas

### TEXAS COMPUTER SYSTEMS

P.O. Box 1327 Arlington, Texas 76004-1327 Toll Free Number 800 433-5184

Texas Residents 817 274-5625

Payment: Money order, cashiers or certified Prices subject to change at any time check. Prices above reflect 3% cash Discount No Tax out-of-state. Texans add 5%.

"Many items shipped FREE. Call for quote."

355

Listing 6 continued: 1110 NEXT I 1120 PRINT #D1 1130 GOTO 290 2000 REM\* QUIT COMMAND 2010 WRITE #D3%P.0 2020 CLOSE #D3 2030 CHAIN S\$+A\$+","+U\$ 3000 REM\* SORT COMMAND 3010 P1=P \REM SAVE CURRENT POSITION OF BYTE POINTER 3020 P\$=\$\$+"SORT"+A\$+","+U\$ 3030 GOSUB 64260 \REM SAVE BYTE COUNTER & PROGRAM NAME TO EXEC 3040 V\$="UPDATE/SORT PROGRAM" 3050 GOSUB 64460 \REM ADD STRING PARAMETER FOR PROGRAM DESCRIPTOR 3060 PRINT #D1, "MASTER ", 3070 GOSUB 64870 \REM GET FILE NAME 3080 GOSUB 64670 \REM SEPARATE OUT UNIT & CHECK FOR EXISTENCE 3090 ON Z GOTO 3170, 3100 3100 INPUT #D1, "MASTER FILE DOESN'T EXIST. IS THIS OKAY (Y/N)? ", X\$ 3110 I\$=X\$ \GOSUB 64990 \REM CHECK FOR NULL INPUT 3120 ON Z GOTO 3130, 65050 3130 IF X\$="Y" THEN 3170 3140 IF X\$="y" THEN 3170 3150 IF X\$="N" THEN 65050 3160 IF XS="n" THEN 65050 ELSE 3100 3170 V\$=F1\$ \GOSUB 64460 \REM ADD STRING PARAMETER F1\$, MASTER FILE NAME 3180 V\$=F2\$ \GOSUB 64460 \REM ADD STRING PARAMETER F2\$, MASTER UNIT NO. 3190 INPUT #D1, "PROCESS UPDATE FILE (Y/N)? ", X\$ 3200 I\$=X\$ \GOSUB 64990 \REM CHECK FOR NULL INPUT 3210 ON Z GOTO 3220, 65050 3220 IF X\$="Y" THEN 3290 3230 IF X\$="y" THEN 3290 3240 IF X\$="N" THEN 3260 3250 IF X\$<>"n" THEN 3190 3260 V\$="" \GOSUB 64460 \REM ADD NULL STRING FOR UPDATE FILENAME 3270 GOSUB 64460 \REM ADD NULL STRING FOR UPDATE UNIT NO. 3280 GOTO 3370 3290 PRINT #D1, "UPDATE ". 3300 GOSUB 64870 \REM GET FILE NAME 3310 GOSUB 64670 \REM SEPARATE OUT UNIT & CHECK FOR EXISTENCE 3320 ON Z GOTO 3350, 3330 3330 F9\$=F\$ \GOSUB 64800 \REM COULDN'T FIND FILE 3340 GOTO 65050 3350 V\$=F1\$ \GOSUB 64460 \REM ADD STRING PARAMETER F1\$, UPDATE FILE NAME 3360 V\$=F2\$ \GOSUB 64460 \REM ADD STRING PARAMETER F2\$, UPDATE UNIT NO. 3370 V=0 3380 INPUT #D1, "SORT BY TITLE, AUTHOR OR DATE (T/A/D)? ", X\$ 3390 I\$=X\$ \GOSUB 64990 \REM CHECK FOR NULL INPUT 3400 ON Z GOTO 3410, 65050 3410 IF X\$="T" THEN V=1 3420 IF X\$="t" THEN V=1 3430 IF X\$="A" THEN V=2

3440 IF X\$="a" THEN V=2 3450 IF X\$="D" THEN V=3 3460 IF X\$="d" THEN V=3

### THE FORTH SOURCE™

FORTH DISKS WITH DOCUMENTATION fig-FORTH Model and Source Listing, with printed Installation Manual and Source Listing.	PRICE	FORTH MANUALS, GUIDES, & DOCUMENTS  "All About FORTH" by Haydon. Ideograms (words) of fig-FORTH, FORTH-79, Starting FORTH and much	PRICE
□ APPLE II 5½ □ 8080/Z80® 8 □ 8086/8088 8 □ H89/Z89 5½	\$65.00	more. A MUST! A public domain product.  — "FORTH Encyclopedia" by Baker and Derick. A	\$20.00
□ APPLE II/II + by MicroMotion. Version 2. FORTH-79 Standard, editor, assembler, 200 pg manual, 5%	100.00	complete programmer's manual to fig-FORTH with FORTH-79 references. Flow Charted	25.00
□ APPLE II/II + COMBO 1 by MicroMotion. Version 2. All of the above plus floating point and HiRes Turtle	440.00	"Starting FORTH" by Brodie. Prentice Hall. Best user's manual available. (soft cover)	16.00
graphics	140.00	☐ "Starting FORTH" (hard cover)	20.00
APPLE II by Kuntze. fig-FORTH editor, assembler, source listing and screens, 5%	90.00	"METAFORTH" by Cassady. Cross compiler with 8080 code.	30.00
ATARI <sup>®</sup> by Pink Noise Studio. fig-FORTH, editor, assembler, missile graphics, sound and handle drivers, 5%	90.00	Proceedings of Technical Conferences  ''1980 FORML'' (FORTH Modification Laboratory)  ''1981 FORML'' Two Volume Set	25.00 40.00
□ CP/M by MicroMotion. Version 2.x. FORTH-79 Standard, editor, assembler. 200 pg manual, 8	100.00	"1981 Rochester University"  MORE FORTH BOOKS & MANUALS	25.00
☐ CP/M Combo 1 by MicroMotion. 2.x. All of the above	4.40.00	□ "Systems Guide □ "APPLE®	
plus floating point.  □ CROMEMCO® by Inner Access fig-FORTH editor,	140.00	to fig-FORTH" 25.00 (MicroMotion)	20.00
assembler, 5¼ or 8	100.00	☐ "Using FORTH" 25.00 User's Manual" ☐ "A FORTH ☐ "CP/M®	20.00
☐ H89/Z89 by Haydon. fig-FORTH Stand Alone, source, editor, assembler & tutorial on disk. 5¼	250.00	Primer" 25.00 (MicroMotion)  "Caltech FORTH User's Manual"	20.00
□ H89/Z89 by Haydon. fig-FORTH, CP/M®, source, editor,assembler, & tutorial on disk, 5½	175.00	Manual" 12.00   "TRS-80®   MMSFORTH   MMSFORTH	
☐ HP-85 by Lange. fig-FORTH, editor and assembler,	90.00	Interpretive User's Manual" Languages" 20.00 "FORTH-79	18.50
5%  IBM® PC/FORTH by Laboratory Microsystems. fig-		□ "Invitation to Standard"  FORTH" 20.00 □ "Tiny Pascal in	15.00
FORTH, editor and assembler. Manual, 5%  IBM-Floating Point by Laboratory Microsystems.	100.00	□ "PDP-11 FORTH fig-FORTH" User's Manual" 20.00 □ "FORTH-79	10.00
Requires PC/FORTH. Specify software or for AMD 9511, AMD 9512 or Intel 8087	100.00	"AIM FORTH Standard User's Manual" 12.00 Conversion"	10.00
☐ IBM-Cross Compiler by Laboratory Microsystems. Requires PC/FORTH. (Nautilus Systems Model)	300.00	INSTALLATION DOCUMENTS	10.00
☐ PET® by FSS. fig-FORTH editor and assembler, 5%	90.00 150.00	<ul> <li>Installation Manual for fig-FORTH, contains FORTH model, glossery, memory map, and instructions</li> </ul>	\$15.00
□ PET® with floating point, strings, disk I/O □ TRS-80/I by Nautilus Systems. fig-FORTH, editor and		Source Listings of fig-FORTH, for specific CPU's and computers.	
assembler, 5%  TRS-80/I or III by Miller Microcomputer Services.	90.00	The above installation manual is required for implementation. Each	15.00
MMSFORTH, FORTH-79 subset, editor, assembler, dbl-precision, arrays, utilities & applications. 210 pg. manual, 5%	130.00	□ 1802 □ 6502 □ 6800 □ AlphaMicro □ 8080 □ 8086/88 □ 9900 □ APPLE II® □ PACE □ 6809 □ NOVA □ PDP-11/LSI/11	
☐ 6800 by Talbot Microsystems. fig-FORTH, editor,	100.00	FORTH PROGRAMMING DISKS	
assembler, disk I/O, FLEX® 5% or 8  G809 by Talbot Microsystems. fig-FORTH, editor,	100.00	☐ "MVP-FORTH" by Haydon & Boutelle. An extended	
assembler, disk I/O, FLEX® 5½ or 8  6809 Enhanced 2nd screen editor,	100.00	program development system. Based on "All About FORTH" and optimized for CP/M and 8080/Z80. A public domain product, 8 inch	\$ 75.00
macroassembler,tutorial, tools and utilities, FLEX	250.00	"FORTH PROGRAMMING AIDS" by Curry Assoc. Decompiler, Subroutine Decompiler, Callfinder and	
<ul> <li>Z80 by Laboratory Microsystems. Editor and assembler, CP/M, 8</li> </ul>	50.00	Translator requires fig-FORTH nucleus. Specify CP/M, 8" or Apple 3.3, 5%	150.00
☐ Z80, floating point, requires Z80 above ☐ Z80, AMD 9511 support, requires Z80 above	150.00 150.00	CROSS COMPILER DISKS Allows extending, modifying and compiling for speed	
☐ Z80 by Inner Access. Editor, assembler and manual, CP/M. 8	100.00	and memory savings, can also produce ROMable code.	
☐ 8080 by Inner Access. Editor, assembler, and manual,		Nautilus (NS), Talbot Microsystems (TM), Laboratory Microsystems (LM) and Inner Access (IA).	
CP/M, 8	100.00	☐ CP/M (NS) 200.00 ☐ IBM (LM)* 300.00	
■ 8086/88 by Laboratory Microsystems. Editor, assembler, CP/M-86®, 8	100.00	☐ H89/Z89 (NS) 200.00 ☐ 8086 (LM)* 300.00 ☐ TRS80/1 (NS) 200.00 ☐ Z80 (LM)* 200.00	
☐ 8086/88 with floating point, CP/M-86	200.00	☐ Northstar (NS) 200.00 ☐ CP/M (IA) 450.00	
☐ 8086/88 with AMD 9511 support CP/M-86	200.00	☐ 6809 (TM) 350.00 ☐ Cromemco (IA) 45  * Requires FORTH disk	0.00

### ORDERS ONLY (415) 961-4103

### **DEALER & AUTHOR INQUIRIES INVITED**

Ordering Information: Check, Money Order (payable to MOUNTAIN VIEW PRESS, INC.), VISA or MasterCard accepted. No COD's or unpaid PO's. California residents add 8½% sales tax. Shipping costs in US included in price. Foreign orders, pay in US funds on US bank, include for handling and shipping by Air: \$5.00 for each item under \$25.00, \$10.00 for each item between \$25.00 and \$99.00 and \$20.00 for each item over \$100.00. Mil prices and products subject to change or withdrawal without notice. Single system and/or single user license agreement required on some products.

Specializing in the FORTH Language

### MOUNTAIN VIEW PRESS, INC.

PO BOX 4656

**MOUNTAIN VIEW, CA 94040** 

(415) 961-4103

- 3470 IF V=0 THEN 3380
- 3480 GOSUB 64360 \REM ADD NUMERIC PARAMETER, SORT OPTION
- 3490 GOSUB 64150 \REM UPDATE NO. OF COMMAND ENTRIES
- 3500 GOTO 290
- 4000 REM\* LIST COMMAND
- 4010 P1=P \REM SAVE CURRENT POSITION OF BYTE POINTER
- 4020 P\$=\$\$+"LIST"+A\$+","+U\$
- 4030 GOSUB 64260 \REM SAVE BYTE COUNTER & PROGRAM NAME TO EXEC
- 4040 VS="LIST PROGRAM"
- 4050 GOSUB 64460 \REM ADD STRING PARAMETER FOR PROGRAM DESCRIPTOR
- 4060 PRINT #D1, "MASTER",
- 4070 GOSUB 64870 \REM GET FILE NAME
- 4080 GOSUB 64670 \REM SEPARATE OUT UNIT & CHECK FOR EXISTENCE
- 4090 ON Z GOTO 4170, 4100
- 4100 INPUT #D1, "MASTER FILE DOESN'T EXIST. IS THIS OKAY (Y/N)? ",X\$
- 4110 I\$=X\$ \GOSUB 64990 \REM CHECK FOR NULL INPUT
- 4120 ON Z GOTO 4130, 65050
- 4130 IF X\$="Y" THEN 4170
- 4140 IF X\$="y" THEN 4170
- 4150 IF X\$="N" THEN 65050
- 4160 IF X\$="n" THEN 65050 ELSE 4100
- 4170 V\$=F1\$ \GOSUB 64460 \REM ADD STRING PARAMETER F1\$, MASTER FILE NAME
- 4180 V\$=F2\$ \GOSUB 64460 \REM ADD STRING PARAMETER F2\$, MASTER UNIT NO.
- 4190 PRINT #D1. "EACH PRINT LINE WILL CONTAIN THE TITLE, AUTHOR & DATE."
- 4200 PRINT #D1, "PLEASE SPECIFY THE ORDER TO PRINT."
- 4210 PRINT #D1, "ENTER 'T' FOR TITLE, 'A' FOR AUTHOR AND 'D' FOR DATE."
- 4220 INPUT #D1, "FIRST ONE? ",B\$
- 4230 IS=B\$ \GOSUB 64950 \REM CHECK FOR NULL INPUT
- 4240 ON Z GOTO 4250, 65010
- 4250 GOSUB 4490 \REM CONVERT B\$ TO 1=T, 2=A, 3=D, 4=NONE
- 4260 B1=Z
- 4270 ON Z GOTO 4280, 4280, 4280, 4220
- 4280 INPUT #D1, "SECOND ONE? ", B\$
- 4290 I\$=B\$ \GOSUB 64950 \REM CHECK FOR NULL INPUT
- 4300 ON Z GOTO 4310, 65010
- 4310 GOSUB 4490 \REM CONVERT B\$ TO 1=T, 2=A, 3=D, 4=NONE
- 4320 B2=Z
- 4330 ON Z GOTO 4340, 4340, 4340, 4280
- 4340 IF B2=B1 THEN 4470
- 4350 INPUT #D1, "THIRD ONE? ", B\$
- 4360 IS=B\$ \GOSUB 64950 \REM CHECK FOR NULL INPUT
- 4370 ON Z GOTO 4380, 65010
- 4380 GOSUB 4490 \REM CONVERT B\$ TO 1=T, 2=A, 3=D, 4=NONE
- 4390 B3=Z
- 4400 ON Z GOTO 4410, 4410, 4410, 4350
- 4410 IF B3=B1 OR B3=B2 THEN 4470
- 4420 V=B1 \GOSUB 64360 \REM ADD NUMERIC PARAMETER B1, 1ST PRINT FIELD
- 4430 V=B2 \GOSUB 64360 \REM ADD NUMERIC PARAMETER B2, 2ND PRINT FIELD
- 4440 V=B3 \GOSUB 64360 \REM ADD NUMERIC PARAMETER B3. 3RD PRINT FIELD
- 4450 GOSUB 64150 \REM UPDATE NO. OF COMMAND ENTRIES
- 4460 GOTO 290
- 4470 PRINT #D1. "INPUT ERROR. PLEASE START OVER."
- 4480 GOTO 4220
- 4490 REM SUBROUTINE TO CONVERT B\$ TO 1=T, 2=A, 3=D, 4=NONE



# The guy on the left doesn't stand a chance.

He's carrying a briefcase with two file folders, a newsmagazine, and a sandwich.

She's carrying the OSBORNE 1\* – the portable personal business computer. Using the OSBORNE 1, she is going to get more work done and better work done – in less time, and with less effort. She won't have to eat lunch at her desk.

Is competition a question of getting ahead, or of not being left behind?

Hardly an academic question in today's business environment. The computer is here to stay. And those who are grasping the tools of this technology are moving forward faster.

The OSBORNE 1 is a powerful computer that can handle all the details of the words, numbers, and information you deal with every day. You free up time to work with the essence of your day, not the detail. And you master a powerful new personal extension. A tool that will enable you to do jobs you simply could not consider before.

Consider the built-in advantage you gain over the person who is still shuffling tedium.

The most intelligent purchase you can make.

Lots of big and little computers can make a similar promise. But none can match this: the OSBORNE 1 delivers two disk drives, a **complete** computer with communications capabilities, a business keyboard, and CRT screen. Plus five productivity software packages with a retail value of over \$1500. Including CP/M,® word processing, an advanced electronic spreadsheet, and BASIC languages. All for a <u>total</u> price of only \$1795. All in a portable package that fits under the seat of your airplane.

To explore the very competitive capabilities of the OSBORNE 1, visit your local authorized computer retailer. A demonstration will show you just how easily you can put the power of the OSBORNE 1 into your career.



The \$1795 suggested retail price for the Osborne 1 (a registered trademark of Osborne Computer Corporation) includes the following software packages: WORDSTAR\* with MAILMERGE\* (a trademark and a registered trademark of MicroPro International Corporation of San Rafeel, California, U.S.A.); SUPERCALC\* (a trademark of Sorcim Corporation); CBASIC\* (a registered trademark of Compiler Systems); MBASIC\* (a registered trademark of Microsoft); and CP/M (a registered trademark of Digital Research).

```
4500 Z=4
4510 IS=B$ \GOSUB 64990 \REM CHECK FOR NULL INPUT
4520 ON Z GOTO 4530, 65050
4530 IF BS="T" THEN Z=1
4540 IF B$="t" THEN Z=1
4550 IF B$="A" THEN Z=2
4560 IF B$="a" THEN Z=2
4570 IF B$="D" THEN Z=3
4580 IF B$="d" THEN Z=3
4590 RETURN
5000 REM*----
5010 REM* SUBROUTINE TO SET UP GLOBAL PARAMETERS
5020 REM*----
5040 PS="GLOBAL"
5050 GOSUB 64260 \REM SAVE BYTE COUNTER & ENTRY ID
5060 INPUT #D1, "DATE: ",D$
5070 INPUT #D1, "TIME: ",T$
5080 V$=D$ \GOSUB 64460 \REM ADD STRING PARAMETER D$, DATE
5090 V$=T$ \GOSUB 64460 \REM ADD STRING PARAMETER T$, TIME
5100 V=66 \REM NO. OF LINES PER OUTPUT PAGE
5110 GOSUB 64360 \REM ADD NUMERIC PARAMETER IN V
5120 V=2 \REM NO. OF LINES FOR TOP MARGIN
5130 GOSUB 64360 \REM ADD NUMERIC PARAMETER IN V
5140 V=3 \REM NO. OF LINES FOR BOTTOM MARGIN
5150 GOSUB 64360 \REM ADD NUMERIC PARAMETER IN V
5160 V=48 \REM MAX LENGTH OF TITLE
5170 GOSUB 64360 \REM ADD NUMERIC PARAMETER IN V
5180 V=20 \REM MAX LENGTH OF AUTHOR
5190 GOSUB 64360 \REM ADD NUMERIC PARAMETER IN V
5200 V=10 \REM MAX LENGTH OF DATE
5210 GOSUB 64360 \REM ADD NUMERIC PARAMETER IN V
5220 WRITE #D3%L1+L1,P,NOENDMARK \REM UPDATE BYTE POINTER
5230 RETURN
64000 REM#-----
64010 REM*----
64020 REM* SUPPORTING ROUTINES
64030 REM*-----
64040 REM*----
64050 REM
64060 REM*----
64070 REM* SUBROUTINE TO UPDATE THE NUMBER OF COMMAND ENTRIES IN THE JCL
64080 REM* FILE AND SET UP THE POINTER TO THE NEXT COMMAND ENTRY
64090 REM*-----
64100 REM
64110 REM* VARIABLES USED BY ROUTINE -
64120 REM* N - CURRENT COUNT FOR NUMBER OF COMMAND ENTRIES
            P1 - BYTE POSITION OF POINTER TO NEXT COMMAND ENTRY
64130 REM*
64140 REM*
            P - BYTE POSITION OF FIRST BYTE OF NEXT COMMAND ENTRY
64150 WRITE #D3%0, N, NOENDMARK
64160 WRITE #D3%P1,P,NOENDMARK
64170 RETURN
64180 REM*----
64190 REM* SUBROUTINE TO SAVE CURRENT BYTE POINTER AND PROGRAM NAME TO
            EXECUTE IN CURRENT COMMAND ENTRY IN THE JCL FILE
```

Listing 6 continued on page 362

# NEC's new letter-quality printer gets personal with IBM.

The Spinwriter<sup>®</sup> 3550 lets the IBM PC get down to business.

NEC's new Spinwriter letter-quality printer is the *only* one plug-compatible with the IBM Personal Computer. So you get the business applications you've been wishing for. Letter-quality output for word and data processing. Multi-language, scientific, and technical printing. Simple forms handling. Quiet operation. And the reliability of the industry's most popular printer line.

NEC designed the new Spinwriter especially for the IBM PC. It comes complete with documentation and training materials to fit your PC user's handbook. Just plug the Spinwriter in and your PC instantly becomes more versatile and flexible.

More than 8 forms handlers and 50 print thimbles boost PC versatility. NEC designed the Spinwriter's 8 modular forms handlers to accommodate a wide range of paper and document sizes and types. The easily mounted handlers let

your computer print out the forms you need for data processing, word processing, graphics, accounting or other business applications.

The Spinwriter's 50 print thimbles can more than triple your PC's usefulness. They come in both constant pitch and proportional-spaced fonts, plus in foreign language, technical and scientific versions. They snap in and out in seconds, and let you print up to 203 columns on 16-inch paper. They each last for more than 30 million impressions.

This printer's special features make everything look better on paper.

The Spinwriter's software-invoked features include automatic proportional spacing; bidirectional, bold and shadow printing; justification; centering; underscoring; and sub/super scripting, all at speeds up to 350 words per minute.

That big extra, Spinwriter reliability. The new 3550 is part of NEC's renowned Spinwriter family, the world's most popular line of letter-quality printers.

Spinwriters have the industry's best mean-time-between-failure rating, in excess of 3,000 hours. In terms of average personal computer usage, that's more than five years.

	tion Systems, Ir , Lexington, M	
Send me more Spinwriter 355	information on 0.	the
Name		
Title		
Company		
Address		
City	State	Zip

NEC NEC Information Systems, Inc.

Circle 300 on inquiry card.



```
Listing 6 continued:
64210 REM*-----
64220 REM
64230 REM* VARIABLES USED BY ROUTINE -
64240 REM* P$ - NAME OF PROGRAM TO EXECUTE (INCLUDES UNIT NUMBER)
64250 REM* P - BYTE COUNTER FOR JCL FILE
64260 WRITE #D3%P,P,P$
64270 P=P+L1+LEN(P$)+L2
64280 RETURN
64290 REM*----
64300 REM* SUBROUTINE TO ADD A NUMERIC PARAMETER TO A COMMAND ENTRY
64310 REM*----
64320 REM
64330 REM* VARIABLES USED BY ROUTINE -
64340 REM* V - NUMERIC VALUE TO ADD
64350 REM* P - BYTE COUNTER FOR JCL FILE
64360 WRITE #D3, V
64370 P=P+L1
64380 RETURN
64390 REM*-----
64400 REM* SUBROUTINE TO ADD A STRING PARAMETER TO A COMMAND ENTRY
64410 REM*----
64420 REM
64430 REM* VARIABLES USED BY ROUTINE -
64440 REM* V$ - STRING VALUE TO ADD
64450 REM* P - BYTE COUNTER FOR JCL FILE
64460 WRITE #D3, V$
64470 P=P+LEN(V$)+L2
64480 RETURN
64490 REM*-----
64500 REM* SUBROUTINE TO DISPLAY INITIAL SIGN-ON MESSAGES
64510 REM*----
64520 PRINT #D1."SAMPLE MAIN" \PRINT #D1
64530 PRINT #D1, "TYPE 'HELP' IN RESPONSE TO 'COMMAND: 'IF YOU ",
64540 PRINT #D1, "NEED DETAILED INSTRUCTION."
64550 PRINT #D1, "TO CANCEL ANY COMMAND JUST TYPE A 'RETURN'",
64560 PRINT #D1." TO ANY INPUT REQUEST."
64570 PRINT #D1
64580 RETURN
64590 REM*-----
64600 REM* SUBROUTINE TO REMOVE UNIT NO. FROM FILE NAME
64610 REM*----
64620 REM
64630 REM* USES F$ - FILE NAME WITH UNIT NO.
64640 REM* RETURNS F1$ - FILE NAME
64650 REM* F2$ - UNIT IN THE FORM ',X'
64650 REM*

F2$ - UNIT IN THE FORM

Z - 1 FOR FILE EXISTS, 2 IF IT DOESN'T
64670 IF FILE(F$)=-1 THEN Z=2 ELSE Z=1
64680 F1$=F$
64690 F2$=",1"
64700 FOR I=1 TO LEN(F$)
64710 IF F$(I,I)<>"," THEN 64730
64720 F1$=F$(1,I-1) \F2$=F$(I) \EXIT 64740
64730 NEXT I
64740 RETURN
64750 REM*----
                                                              Listing 6 continued on page 364
```



Our new MC-1000 Computer System is proof that the age of affordability in computers has arrived. Thanks to single board design we can offer not only the lowest priced computer in its class but also the most reliable. For information and ordering call:

(414) 784-2312

#### **ALL STANDARD**

- · 64K Memory
- 2-51/4" Disk Drives (225K Total Storage)
- · Real Time Clock
- 2-RS-232 Interfaces
- Parallel Printer Port (Centronics Type)
- Extensive Self Diagnostics (In Rom)
- 2 Year Limited Warranty

#### **OPTIONS**

- Disk Capacity to 1.8 MBYTE
- · UCSD Pascal, Basic, Fortran

'TM U. Of California

### MILWAUKEE COMPUTERS INC.

16235 W. RYERSON ROAD \* NEW BERLIN, WI 53151 \* (414) 784-2312

```
64760 REM* SUBROUTINE FOR FILE ERROR MESSAGE
64780 REM
64790 REM* USES F9$ - FILE NAME
64800 PRINT #D1, "COULDN'T FIND FILE ", F9$
64810 RETURN
64820 REM*-----
64830 REM* SUBROUTINE FOR REQUESTING FILE NAME
64840 REM*----
64850 REM
64860 REM* RETURNS FILE NAME IN F$
64870 INPUT #D1, "FILE NAME: ",F$
64880 I$=F$
64890 GOSUB 64990 \REM CHECK FOR NULL INPUT
64900 ON Z GOTO 64910, 65050
64910 RETURN
64920 REM*-----
64930 REM* CHECK FOR NULL STRING
64940 REM*-----
64950 REM
                  I$ WHICH CONTAINS THE INPUT STRING TO CHECK
64960 REM* USES
64970 REM* RETURNS Z = 1 IF THE LEN(I$)>0
                     2 IF THE LEN(I$)=0
64980 REM*
64990 Z=1
65000 IF I$="" THEN Z=2
65010 RETURN
65020 REM*----
65030 REM* BACKUP FILE POINTER TO BEGINNING OF ENTRY
65040 REM*----
65050 READ #D3%P1-1,&Z \REM READ TO POSITION PTR AT P1
65060 P=P1 \REM BACKUP RUNNING BYTE COUNTER
65070 N=N-1 \REM BACKUP ENTRY COUNTER
65080 GOTO 290
```

# If you won't read these 7 signals of cancer...

You probably have the 8th.

American Cancer Society

- 1. Change in bowel or bladder habits.
- **2.** A sore that does not heal.
- **3.** Unusual bleeding or discharge.
- 4. Thickening or lump in breast or elsewhere.
- **5.** Indigestion or difficulty in swallowing.
- **6.** Obvious change in wart or mole.

- 7. Nagging cough or hoarseness.
- 8. A fear of cancer that can prevent you from detecting cancer at an early stage. A stage when it is highly curable. Everyone's afraid of cancer, but don't let it scare you to death.



# We'd like your Gapple to meet The Executive Secretary

The professional word processing system for the Apple™ computer

#### GENERAL Editing, printing, form letters, mail-merge, and electronic mail all in one package at one price? User's manual designed for the user? User-controlled configuration of printers, slots, drives, and 40/80 column editing? THE MANUAL Complete index included? Organized as a set of lessons? Easel-bound for ease of use? THE DOCUMENT PRINTER Integrates files from DB MASTER's Utility Pack M, The Data Factory M, Visicalc M, Information Master M, and most Accepts keyboard input at print time? Supports all major printers, including Centronics 737 and IBM ET- series? Has IF and related commands to allow conditional printing of information based on the contents of a database or on keyboard input? Prints page headers of arbitrary complexity? Prints page numbers wherever you want them? Automatically generates alphabetical index for words you specify? Supports file chaining and file nesting? Has multi-level outline indenting? Has left- and right-justified tab stops? Gives full control of all margins, dynamic text reformatting, centering, and justification? Supports Thunderclock<sup>™</sup> and the CCS clockcard for automatic dating?

#### check this chart:

INTEGRATED CARD FILE FEATURES Allows multiple card files per disk?	-
Allows user to define size and content of 'cards' in each file?	-
Generates new subset card files based on search or sort criteria for an existing file?	1
Incorporates one/multiple line report printer for card files?	-
Allows totals and subtotals during report printing?	~
THE DOCUMENT EDITOR Keeps up with professional typing speeds?	_
User-defined phrase abbreviations?	~
40 or 80 character edit modes user-selectable?	-
Supports Smarterm $^{\text{IM}}$ , Superterm $^{\text{IM}}$ , Videoterm $^{\text{IM}}$ and Full View $80^{\text{IM}}$ .	~
Uses real shift key?	-
Supports file merge and unmerge?	~
Global search and replace?	~
Block operations: move, transfer, delete?	-
Character/word/line: insert/replace/delete?	-
Allows embedded commands to control special printer functions?	-
ELECTRONIC MAIL SYSTEM Menu driven?	_
Multiple document queuing?	-
Fully automatic with Hayes modem?	1

#### Published by:

Available at computer stores nationwide. \$250 suggested retail.



4306 Upton Avenue South Minneapolis, Minnesota 55410 Phone (612) 929-7104

Now available: The Executive Speller™. Allows on-the-fly corrections and specialized dictionaries. 25,000 word capacity. Suggested retail \$75.00.

```
10 REM* SUBEXECUTIVE (SAVED IN FILE %!)
20 REM* 11/11/80
25 DIM P$(80)
30 D1=0 \REM DEVICE FOR CONSOLE
40 D3=0 \REM DISK DRIVE FOR SYSTEM
41 L1=5 \REM NO. OF BYTES FOR NUMERIC VALUES
42 L2=2 \REM NO. OF OVERHEAD BYTES FOR A STRING < 256 CHAR
43 S$="%!" \REM PREFIX FOR SYSTEM FILE NAMES
50 FOR I=1 TO 3
60 US=CHR$(I+48)
70 IF FILE(S$+"JCL,"+U$)=3 THEN EXIT 100
80 NEXT I
90 PRINT #D1, "COULDN'T FIND JOB CONTROL FILE." \END
100 OPEN #D3, S$+"JCL,"+U$
110 READ #D3, N, NO, N1
120 IF NO=N THEN END
130 P=N1 \REM NO. OF BYTES FOR N+NO
140 FOR I=0 TO NO
150 READ #D3%P, P1
160 P=P1
170 NEXT I
180 READ #D3, X$, P$
190 WRITE #D3%L1, NO+1, NOENDMARK
195 PRINT #D1, "... EXECUTING...", P$
```

Text continued from page 348:

200 CHAIN X\$

P\$=S\$+(program name)+ A\$+","+U\$ GOSUB 64260 V\$=(program description) GOSUB 64460

GOSUB 64360 GOTO 290 (end of command processing)

5000-5230 Setting Up Global Parameters. These lines repeatedly call utility routines to put parameters common to all programs into the job-control file. Since the code does not evaluate the date and time variables, D\$ and T\$, the user can input date and time in any form so long as the entries are ten characters or fewer in length.

#### The Subexecutive

Listing 7 is the subexecutive (%!) program. Since the subexecutive's only functions are to read the next en-

try in the job-control file and transfer control to the program indicated by that file, the subexecutive is independent of application. Here are comments, by line number, on the subexecutive.

50-80 Drive Determination. The subexecutive searches for the disk drive that contains the job-control file.

100-110 Read Initial Job-Control Parameters. These lines read the number of entries in the file (N), the last entry processed (N0), and the pointer giving the byte position (N1). 130-180 Read Name of Program for CHAINing. The first parameter of each entry is the pointer to the next entry, except in the case of the last entry, whose first parameter is set to 0. This program segment exploits North Star BASIC's direct addressing of disk files for positioning and reading parameters at the correct byte. This segment also reads the name of the program, X\$, and the descriptive phrase about the program, P\$.

190 Update the Entry Counter. This updates the entry counter (the second parameter in the file) by 1, so that it

points to the next entry to be processed.

195-200 Transfer Control to Next Program. These lines display on the console a message that tells which program is running and then CHAIN the next program.

#### The Update/Sort Program

Listing 8 is the update/sort (%!SORT) program. I will describe only those features of this program that relate to its overall structure and its use of the executive.

30–90 Overall Program Flow. These lines all call subroutines. The simplest way to develop a program for execution in this system is to call a series of subroutines, each of which performs a major function. This allows isolation of the part of the program at lines 1000, 2000, and 7000 that interfaces with the executive and the jobcontrol file. The other subroutines at lines 3000, 4000, 5000, and 6000 actually do the updating and sorting.

section of code dimensions arrays, initializes variables, and reads in the McGraw-Hill Bookstore

## The James Martin Files

Published by Prentice-Hall



- 1. The Telematic Society 350 pp. \$12.95
- 2. Design and Strategy for Distributed Data Processing 624 pp. \$37.50
- 3. Computer Networks and Distributed Processing 562.pp. \$34.00
- 4. An End-User's Guide to Data-Base 144 pp. \$21.95
- 5. Application Development Without Programmers 350 pp. \$32.50

Break Into The Future

With the World's Foremost Authority on Computer Technology

- 6. Design of Real-Time Computer Systems 629 pp. \$24.95
- 7. Computer Data-Base Organization, 2nd Ed.
  - 8. Systems Analysis for Data Transmission 910 pp. \$39.95
- 17. Security, Accuracy and Privacy in Computer Systems 626 pp. \$34.00
  - 18. Introduction to Teleprocessing 266 pp. \$22.95
- 9. Communications Satellite Systems 398 pp. \$39.50
  - 10. Principles of Data-Base Management 352 pp. \$23.95
- 11.Teleprocessing Network Organization 290 pp. \$17.95
  - 12. The Computerized Society 560 pp. \$18.95
  - 13. Future Developments in Telecommunications, 2nd Ed. 668 pp. \$37.00
- 14. Telecommunications and the Computer 670 pp. \$37.50
  - 15. Design of Man-Computer Dialogues 559 pp. \$32.00
- 16. Programming Real-Time Computer Systems 386 pp. \$19.95

McGraw-Hill Bookstore 1221 Ave. of the Americas

New York, New York 10020

Please send me \_\_\_\_\_ copies of book no. \_
\_\_\_\_ copies of book no. \_
\_\_\_\_ copies of book no. \_

\_\_\_\_\_ copies of book no. \_\_\_\_\_ Check or credit card: AmerExp. \( \square\) MasterCard \( \square\) Visa \( \square\)

Acct. No. Expires Name

Address\_\_\_\_\_\_State\_\_\_\_Zip\_\_\_

Add local sales tax plus \$2.50 postage and handling for the first book, \$1.00 for each additional book.

BY5

Listing 8: The update/sort program (%!SORT). Lines 30 through 90 control the flow of the program by calling seven subroutines—one for each major program function.

```
10 REM* SAMPLE SORT PROGRAM (SAVED IN FILE '%!SORT')
20 REM* 12/16/80 WRITTEN BY GENE F. WALTERS
30 GOSUB 1000 \REM READ IN GLOBAL DATA
40 GOSUB 2000 \REM READ IN SORT COMMAND DATA
50 GOSUB 3000 \REM READ IN MASTER FILE
60 GOSUB 4000 \REM READ UPDATE FILE AND MERGE WITH MASTER DATA
70 GOSUB 5000 \REM SORT MERGED DATA
80 GOSUB 6000 \REM WRITE OUT NEW MASTER FILE
90 GOSUB 7000 \REM RETURN TO SUBEXECUTIVE
1000 REM*-----
1010 REM* SUBROUTINE TO READ IN GLOBAL DATA
1020 REM*-----
1030 DIM P$(80)
1040 D1=0 \REM DEVICE FOR CONSOLE
1050 D2=1 \REM DEVICE FOR PRINTER
1060 D3=0 \REM DISK FILE FOR THE SYSTEM
1070 D4=1 \REM MASTER FILE
1080 D5=2 \REM UPDATE FILE
1090 U=3 \REM NO. OF DRIVES IN SYSTEM
1100 S$="%!" \REM PREFIX FOR SYSTEM FILE NAMES
1110 FOR I=1 TO U
1120 US=CHR$(I+48)
1130 IF FILE(S$+"JCL,"+U$)=3 THEN EXIT 1160
1140 NEXT I
1150 PRINT #D1, "COULDN'T FIND JOB CONTROL FILE." \END
1160 OPEN #D3,S$+"JCL,"+U$
1170 READ #D3, N, NO, N1 \REM-# CMD ENTRIES, CURRENT CMD, PTR TO 1ST ENTRY
1180 READ #D3, P$ \REM PASS OVER FIRST STRING
1190 READ #D3,D$,T$ \REM READ IN DATE AND TIME
1200 READ #D3, P5, P6, P7 \REM LINES/PAGE, TOP MARGIN, BOTTOM MARGIN
1210 READ #D3, K1, K2, K3 \REM MAX LENGTH FOR TITLE, AUTHOR, DATE
1220 K9=K1+K2+K3
1230 DIM E$(125*K9), X$(K9+3), A(132), E1$(K1), E2$(K2), E3$(K3)
1240 DIM Q$(K9),Q0$(K9),B$(K9),B0$(K9)
1250 P=0 \REM PAGE COUNTER
1260 L=0 \REM LINE COUNTER
1270 RETURN
2000 REM*-----
2010 REM* SUBROUTINE TO READ IN SORT COMMAND DATA
2020 REM*-----
2030 P2=N1
2040 FOR I=1 TO NO
2050 P1=P2
2060 READ #D3%P1,P2
2070 NEXT I
2080 READ #D3, P$, P$ \REM PASS OVER FIRST TWO STRINGS
2090 READ #D3,F1$,U1$ \REM FILE NAME & UNIT FOR MASTER
2100 READ #D3,F2$,U2$ \REM FILE NAME & UNIT FOR UPDATES
2110 READ #D3.M \REM FIELD TO SORT ON
2120 CLOSE #D3
2130 RETURN
```

Listing 8 continued on page 370

3000 REM\*----

# The Logo Language is Here for the Apple II

TO SQUIRAL :ANGLE :DISTANCE
IF :DISTANCE > 200 THEN STOP
FORWARD :DISTANCE
RIGHT :ANGLE
SQUIRAL :ANGLE :DISTANCE + 3
END

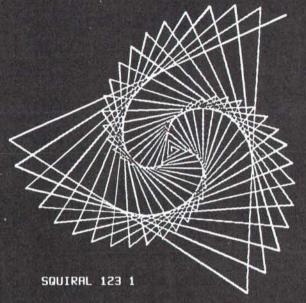
Terrapin, the Turtle Company, brings you the Terrapin Logo Language for the Apple II with Turtle graphics, now ready for immediate delivery.

The Terrapin Logo language is a sophisticated and powerful language that is easy for anyone to use. Although originally intended for children, the Logo language is one that the most advanced programmers will enjoy using too. It includes many features common to artificial intelligence research languages permitting programs of great power to be written quickly and easily. Writing comparable programs in other languages is usually much more difficult and time consuming.

The Turtle graphics is fun and easy. With simple commands such as FORWARD, RIGHT, and PENUP you can draw in six hi-res colors. In just a few short sessions you can learn to create figures more complex than the one above whether you know how to program or not.

But the Terrapin Logo language is more than just a graphics language. It supports:

- list structure, allowing easy manipulation of words (strings) and lists
- user defined procedures which can be used exactly as if they were part of the language.
- fully integrated screen editor for procedures and text
- floating point and integer arithmetic
- a total of 120 primitives (commands) including 30 graphics commands
- recursion
- assembly-language interface capability



The Terrapin Logo language was developed by the Artificial Intelligence lab at the Massachusetts Institute of Technology. Terrapin is now authorized by MIT to distribute the results of its 12 years of research to you. To provide quality support for the language, Terrapin has assembled a team that includes two of the three authors who developed the Logo language for the Apple II at MIT, as well as Dr. Feurzeig, the originator of the Logo language.

Every copy of the Terrapin Logo language comes with complete documentation. To run the language, a 48K Apple II with a 16K RAM card or a language card, and one disk drive is required.

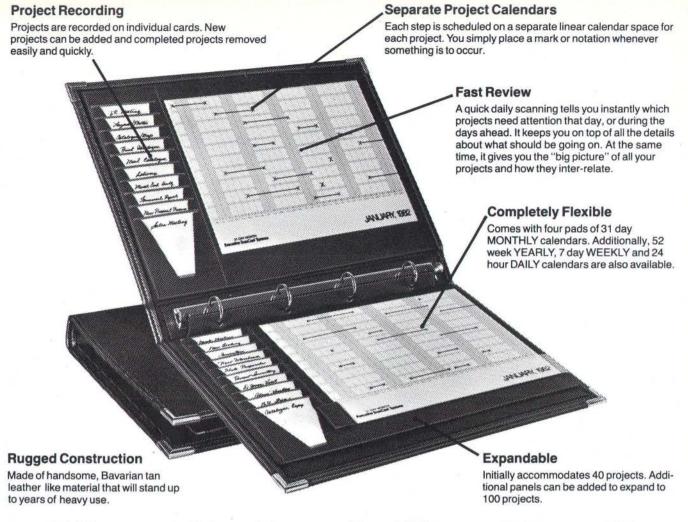
Terrapin also offers the robot Turtle, and the following books: Turtle Geometry, Special Technology for Special Children, Mindstorms, Katie & the Computer, and Apple Logo from Byte Books.

Suggested retail price: \$149.95
To order or for more information, call or write:



Terrapin, Inc.
678 Massachusetts Avenue
Cambridge, MA 02139
(617) 492-8816

```
3010 REM* SUBROUTINE TO READ MASTER FILE
3020 REM*----
3030 E=0 \REM NO. OF ENTRIES
3040 ES="" \REM STRING ARRAY FOR ENTRIES
3050 IF FILE(F1$+U1$)<>3 THEN RETURN
3060 OPEN #D4.F1$+U1$
3070 IF TYP(D4)=0 THEN 3120
3080 READ #D4, E1$, E2$, E3$
3090 E$=E$+E1$+E2$+E3$
3100 E=E+1
3110 GOTO 3070
3120 CLOSE #D4
3130 RETURN
4000 REM*----
4005 REM* SUBROUTINE TO READ UPDATE FILE
4010 REM*----
4015 IF F2S="" THEN RETURN
4020 OPEN #D5%2,F2$+U2$
4025 READ #D5.&A(1) \REM READ # OF BYTES IN LINE
4030 IF A(1)=1 THEN 4355 \REM END OF BASIC TYPE 2 FILE
4035 FOR I=2 TO A(1) \REM READ IN BASIC LINE
4040 READ #D5, &A(I)
4045 NEXT I
4050 XS="" \REM INITIALIZE STRING FORM OF BASIC LINE
4055 S=0 \REM SET S TO INDICATE ADD ENTRY OPERATION
4060 \text{ FOR } I=4 \text{ TO } A(1)-1
4065 IF A(I)=34 THEN EXIT 4085 \REM SEARCH FOR QUOTE
4070 IF A(I)=229 THEN S=1 \REM SET S TO INDICATE DELETE ENTRY
4075 NEXT I
4080 GOTO 4340
4085 J1=I+1
4090 FOR I=A(1)-1 TO J1 STEP -1 \IF A(I)=34 THEN EXIT 4100 \NEXT I
4095 GOTO 4340
4100 J2=I-1
4105 FOR I=J1 TO J2 \REM CONVERT LINE TO A STRING
4110 X$=X$+CHR$(A(I))
4115 NEXT I
4120 C=0
4125 FOR I=1 TO LEN(X$) \REM CHECK FOR PROPER NO. OF '\'
4130 IF X$(I,I)="\" THEN C=C+1
4135 NEXT I
4140 IF C<2 THEN 4340 \REM LINE IN ERROR
4145 IF C=2 THEN 4160
4150 IF C>3 THEN 4340
 4155 IF X$(LEN(X$))<>"\" THEN 4340
 4160 E1$=""
 4165 FOR I=1 TO LEN(X$)
 4170 IF X$(I,I)="\" THEN EXIT 4185
 4175 E1$=E1$+X$(I,I)
 4180 NEXT I
 4185 IF E1$="" THEN CO=1 ELSE CO=0 \REM CO = NO. OF BLANK FIELDS
 4190 FOR K=1 TO K1-LEN(E1$)
 4195 E1$=E1$+" "
                                                                 Listing 8 continued on page 372
 4200 NEXT K
```



# **New Scheduling Tool!**

At last, a unique and completely portable scheduling system that's guaranteed to improve management productivity.

It's called the **ScheduleMate™** scheduling system, and it can literally do away with scheduling conflicts, missed deadlines, last minute rushes and the resulting costly overtime. How? By providing a compact and completely portable "scheduling center" for all your project activities.

The **ScheduleMate**™ utilizes a separate project card and a separate scheduling calendar for each project, which means you can schedule each one individually. Then there's no more relying on memory, or trying to jam everything onto a single appointments calendar. And unlike bulky wall mounted units, the ScheduleMate is completely portable, so you can take it wherever you need it.

As a result, you have complete control over all your projects, including all the details of who is supposed to do what...and when. Then, in a matter of seconds, you can see what's due today... or... tomorrow... or even next week. As a result, you eliminate the disappointments and chaos that come from a lack of good scheduling and follow up. Instead, you are always prepared, and all of your projects run smoothly on schedule.

#### **Satisfaction Guaranteed**

We know you'll be pleased with the way the **ScheduleMate**™ system improves productivity. However, if you are not, *for any* reason, you may return it within 30 days for a complete and courteous refund. National Introductory Price

\$59<sup>95</sup>

Add \$3 shipping and handling. Ohio residents add sales tax.

We honor American Express, MasterCard, Diners Club and Visa.

To order phone

800-848-2618

IN OHIO CALL: 800-282-2630

or mail check to:

Executive ScanCard ™ Systems Dept. 307 6480 Busch Blvd. Suite 200 Columbus, Ohio 43229

Circle 167 on inquiry card.

Orders outside the U.S. are assessed a minimum Air Parcel Post charge per unit as follows: Canada \$7.50; Mexico \$12; all other countries \$18

PATENTS PENDING © COPYRIGHT 1982 EXECUTIVE SCANCARD \*\* SYSTEMS

```
4205 E2$=""
4210 FOR J=I+1 TO LEN(X$)
4215 IF X$(J,J)="\" THEN EXIT 4230
4220 E2$=E2$+X$(J,J)
4225 NEXT J
4230 IF E2$="" THEN CO=CO+1 \REM INCREMENT BLANK FIELD COUNTER
4235 FOR K=1 TO K2-LEN(E2$)
4240 E2$=E2$+" "
4245 NEXT K
4250 E3$=""
4255 FOR I=J+1 TO LEN(X$)
4260 IF X$(I,I)="\" THEN EXIT 4275
4265 E3$=E3$+X$(I,I)
4270 NEXT I
4275 IF E3$="" THEN CO=CO+1 \REM INCREMENT BLANK FIELD COUNTER
4280 FOR K=1 TO K3-LEN(E3$)
4285 E3$=E3$+" "
4290 NEXT K
4295 IF S=0 THEN 4310
4300 GOSUB 4365 \REM DELETE ENTRY
4305 GOTO 4025
4310 IF CO >> 3 THEN 4325 \REM CHECK FOR ALL FIELDS BLANK
4315 GOSUB 4465 \REM ERROR IN ENTRY
4320 GOTO 4025
4325 E$=E$+E1$+E2$+E3$
4330 E=E+1
4335 GOTO 4025
4340 GOSUB 8000 \REM CHECK FOR PAGE HEADING
4345 PRINT #D2, "COULDN'T PROCESS LINE", %61, A(2)+A(3)*256," IN UPDATE FILE."
4350 GOTO 4025
4355 CLOSE #D5
4360 RETURN
4365 REM* ROUTINE TO DELETE AN ENTRY
4370 X$="" \FOR I=1 TO K9 \X$=X$+" " \NEXT I
4375 S1=0 \REM INDICATOR FOR ENTRY FOUND
4380 REM DETERMINE WHICH FIELDS ARE BLANK
4385 IF E1$=X$(1,K1) THEN I1=0 ELSE I1=1
4390 IF E2$=X$(1,K2) THEN I2=0 ELSE I2=1
4395 IF E3$=X$(1,K3) THEN I3=0 ELSE I3=1
4400 FOR I=1 TO E
4405 IF I1 THEN IF E1$<>E$(K9*I-K9+1,K9*I-K2-K3) THEN 4425
4410 IF I2 THEN IF E2$<>E$(K9*I-K2-K3+1,K9*I-K3) THEN 4425
4415 IF I3 THEN IF E3$=E$(K9*I-K3+1,K9*I) THEN EXIT 4490
4420 IF NOT 13 THEN EXIT 4490
4425 NEXT I
4430 REM ENTRY NOT FOUND
                          REM ENTRY HAS BEEN FOUND - NO MSG
4435 IF S1=1 THEN RETURN
4440 GOSUB 8000 \REM CHECK FOR PAGE HEADING
4445 PRINT #D2, "COULDN'T FIND ENTRY TO DELETE THAT IS ON LINE ",
4450 PRINT #D2, A(2)+A(3)*256,""."
 4455 RETURN
 4460 REM INVALID DELETE REQUEST
 4465 GOSUB 8000 \REM CHECK FOR PAGE HEADING
                                                                  Listing 8 continued on page 374
```

## Shugart, Qume, Tandon, MPI, Siemens, Remex, Altos, Apple, Epson, NEC, Tally and more.

#### Apple II Add-on Disk Drive (Runs 3.2 or 3.3 DOS)

## for only \$339.00

DISK DRIVES		COMPUTERS	
Shugart		Altos	
SA 400	\$230	8000-10	Call
SA 450	\$285	8000-12	for
SA 800/801	\$385	8000-14	price
SA 850/851	\$535		•
Qume			
DT-8	\$479		1
DT-5	\$285	PRINTERS	
Tandon		Epson	
TM100-1	\$225	MX-80	\$469
TM100-2	\$285	MX 80 FT	\$569
TM100-3	\$285	MX 100	\$769
TM100-4	\$399		
TM848-1	\$449	Tally	
TM848-2	\$549	MT1602	\$139
		MT1605	\$139
MPI		MT1802	\$169
92-M	\$389	MT1805	\$169
Siemens		NEC - Spinwriter	
FDD 200-8	\$525	Model 7710	\$233
FDD 100-8	\$370	Model 7720	\$269
		Model 7730	\$2340
Tandon Winchester		Model 7715	\$259
TM 602-5MB	\$1040	Model 7725	\$310
TM 603-10MB	\$1199	PC 8023	\$ 62
Corvus		Data Products	
5MB	\$2999	D50	\$149
10MB	Call		
20MB	for	Prices are subject to chang	e without noti
Mirror Backup	price	i i i des an e sue jeur to offarig	

Contact:

P.D.S., inc.

2630 Walnut Avenue, Suite H, Tustin, CA 92680

(714) 730-7207

```
4470 PRINT #D2, "AT LEAST ONE FIELD MUST BE NON-BLANK ON LINE ",
4475 PRINT #D2,A(2)+A(3)*256,"."
4480 RETURN
4485 REM FOUND ENTRY TO DELETE
4490 FOR J=I TO E-1
4495 E$(K9*J-K9+1,K9*J)=E$(K9*J+1,K9*J+K9)
4500 NEXT J
4505 E$=E$(1,LEN(E$)-K9) \REM TRUNCATE STRING BY ONE ENTRY
4510 E=E-1 \REM DECREMENT ENTRY COUNTER
4515 S1=1 \REM SET INDICATOR TO ENTRY FOUND
4520 GOTO 4400 \REM LOOK FOR ANOTHER TO DELETE
5000 REM*----
5010 REM* SUBROUTINE TO SORT THE MERGED DATA
5020 REM*----
5030 DEF FNF$(X)
5040 ON M GOTO 5050, 5060, 5070
5050 RETURN E$ (K9*X-K9+1, K9*X-K2-K3)
5060 RETURN E$ (K9*X-K2-K3+1, K9*X-K3)
5070 RETURN ES(K9*X-K3+1,K9*X)
5080 FNEND
5090 DEF FNP(X)=(X-((X/2-INT(X/2))*2))/2
5100 DEF FNB(X)
5110 K=0
5120 IF FNF$(X+X)< FNF$(X+X+1) THEN K=1
5130 RETURN X+X+(K AND (X+X<T))
5140 FNEND
5150 FOR T=2 TO E
5160 Q$=FNF$(T) Q0$=E$(K9*T-K9+1,K9*T) \I=T
5170 IF I=1 THEN 5220
5180 J=FNP(I)
5190 IF Q$<=FNF$(J) THEN 5220
5200 E$(K9*I-K9+1,K9*I)=E$(K9*J-K9+1,K9*J) \I=J
5210 GOTO 5170
5220 E$ (K9*I-K9+1, K9*I)=Q0$
5230 NEXT T
5240 T=E
5250 B$=FNF$(T) \BO$=E$(K9*T-K9+1,K9*T)
5260 E$ (K9*T-K9+1,K9*T)=E$(1,K9) \T=T-1 \I=1
5270 IF I+I>T THEN 5320
5280 J=FNB(I)
5290 IF FNF$(J)<=B$ THEN 5320
5300 E$(K9*I-K9+1,K9*I)=E$(K9*J-K9+1,K9*J) \I=J
5310 GOTO 5270
5320 E$ (K9*I-K9+1,K9*I)=B0$
5330 IF T>=2 THEN 5250
5340 RETURN
6000 REM*----
6010 REM* SUBROUTINE TO WRITE OUT NEW MASTER
6020 REM*----
6030 F$=F1$+U1$ \L9=INT((LEN(E$)+3*L2*E+255)/256)
 6040 IF FILE(F$)=-1 THEN 6060
 6050 DESTROY F$
 6060 CREATE F$, L9
```

Listing 8 continued on page 376

6070 OPEN #D4,F\$

### C. ITOH F-10 **PRINTMASTER**

### **False Advertising?**

C. ITOH F-10 PRINTMASTER 40 CPS DAISY WHEEL PRINTER ...and, you may have to get in line to get the best price.

What a mess. If you saw our ad last month, and a lot of people did, you probably know we are selling the best price/ performance daisy wheel printer on the market at the unbelievable price of \$1295. Now we are being told we are embarassing C. Itoh Electronics and using false advertising. Well, you decide.

Since we believe in free enterprise and competition, we recognized this printer would be a big success. The F-10 printer is everything a great printer should be. It's not a toy, but a full function 40 CPS printer designed to go after the Diablo 630 and it's competitors from Qume and NEC. Constructed on a cast aluminum base with durable metal parts, the quality is second to none.

To offer the \$1295 price we arranged to buy the unit from a source that has the best price C. Itoh offers to a volume purchaser

We scheduled the printers shipments, placed our advertising, and got ready. We knew the market was waiting for this kind of quality at the right price.

What we weren't ready for was the reaction of C. Itoh Electronics and their distributor Leading Edge Products. To say the least it wasn't pleasant.

Before the first ad hit the street some people received pre-publication copies. The phone started ringing off the hook. The callers are asking a lot of questions about who we are and do we have printers. Kind of like the questions a competitor might ask to see if you are for real. We are.

#### THE PRESIDENT CALLS

Then the president of C. Itoh Electronics calls and wants to know where we got the printers from and if we have them in stock. A very nice man, but a funny question. We decline to answer.

Its not over yet. The national sales manager calls next, and boy is he mad. Seems that he doesn't like us calling the F-10 a C. Itoh printer since we don't buy them directly from them. A rose by any other name. He tells us that our offer of a factory warranty is misleading, and they are getting a lot of calls. Since our supplier has warranty service from C. Itoh it

seemed like a good idea to pass it on to you. Maybe not. We tell him we will clarify this in furture advertising. He seems

About this time we start our wholesale program to dealers and resellers. To say the least they were as excited as we were about the printer. Orders started rolling in, and we started shipping the printers. Sounds like everyone is happy so far. You are getting a great price, the dealers get a wholesale price, and C. Itoh is getting their asking price.

About this time two guys from Leading Edge Products come walking in the door to check us out, we're flattered, they leave. We can't say they are thrilled about our price, but thats what competition is all about. They sell parallel units to the dealers at \$1250, and recommend a list price of \$1995. Have you seen their ad about saving \$800?

#### THE STING

Our customers start telling us that they've been told by Leading Edge Products that we're not for real. We call posing as a end user and they tell us the same thing. Dirty pool.

Oh well, the phone is ringing off the hook, we are going crazy because unlike many distributors we take each unit out of the box and test it. This takes time and the buyers seem to be in a hurry. We start to think about our next shipment, and hiring another technician.

Now the rub. Our source for these units is being hassled. Three heavyweights from C. Itoh tell them that they don't like the way we are selling the units, and that this might jeopardize their shipments in the future, and in fact the units confirmed for delivery the next two months are now "not confirmed."

#### A PRICE PROBLEM

Our source is told the low price is giving the unit a cheap image and they don't like it. Their marketing plans are being spoiled by these low prices, and they are going to stop it. We think you can tell the difference between "cheap quality" and "cheap prices."

You may be getting the feeling that

we are a bunch of nuts for selling this printer at such a low price. Not so, we make a nice profit and we intend to sell a lot of printers.

We also sell lots of accessories to go with the printers at great prices. Another profit center - and one stop shopping for our customers.

What C. Itoh is really unhappy about is that they are being flooded with calls about us wanting to know what the catch is. What you should really call about is to tell them you want them to get off our case so you can get this great printer at a great price.

#### **LET THEM KNOW**

Better yet send the president a note telling him that free enterprise and competition is what America is all about.

The man to tell is:

Mark Takeuchi - President C. Itoh Electronics 5301 Beethoven Street Los Angeles, CA 90066

If you will send us a copy of your letter with your order we will throw in a box of ribbons and a couple of print wheels of your choice as a gesture of our appreciation for your support.

Just circle the reader service card and we will send you a full set of specifications, and our warranty policy (we do our own service). Doesn't exactly like sound like your typical mail order distributor does it. And if you ask we will even tell you the names of some happy users. Happy because of our service, the great product, the low price, and our money back guarantee if not satisfied in

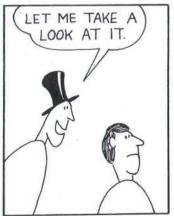
# riter, inc.

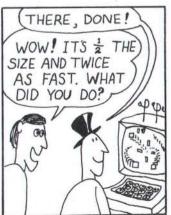
**1703 STEWART STREET** SANTA MONICA, CA 90404 TELEPHONE (213) 829-6871

```
6080 FOR I=1 TO E
6090 WRITE #D4, E$ (K9*I-K9+1, K9*I-K2-K3)
6100 WRITE #D4,E$(K9*I-K2-K3+1,K9*I-K3)
6110 WRITE #D4, E$ (K9*I-K3+1, K9*I)
6120 NEXT I
6130 CLOSE #D4
6140 RETURN
7000 REM*----
7010 REM* RETURN TO SUBEXECUTIVE
7020 REM*----
7030 IF P=0 THEN 7070
7040 FOR I=P5-L-2 TO P5 \REM EJECT TO A NEW PAGE
7050 PRINT #D2
7060 NEXT I
7070 CHAIN S$+","+U$
8000 REM*----
8010 REM* SUBROUTINE FOR PAGE HEADING
8020 REM*----
8030 IF L=0 THEN 8060
8040 L=L-1
8050 RETURN
8060 IF P=0 THEN 8100
8070 FOR I=1 TO P7 \REM BOTTOM MARGIN
8080 PRINT #D2
8090 NEXT I
8100 P=P+1
8110 FOR I=1 TO P6 \REM TOP MARGIN
8120 PRINT #D2
8130 NEXT I
8140 PRINT #D2, "ERRORS", TAB(40-INT((LEN(D$)+LEN(T$)+2)/2)),
8150 PRINT #D2,D$," ",T$,TAB(73),"PAGE",%31,P
8160 PRINT #D2
 8170 L=P5-P6-P7-3
```



8180 RETURN







Get Omni quality for as little as \$1.99... even if all you want is a 10 pack.

Call toll-free for great savings on Omni's complete line of 51/4" premium disks. Each is certified error-free at a minimum of twice the error threshold of your system. Each is rated for more than 12 million passes without disk-related errors or significant wear. And each is precision fabricated to exceed all ANSI specifications with such standard features as reinforced hub rings and Tyvec sleeves. Get same day shipment and an unconditional, no hassle money-back guarantee.

## **ARCHIVE**

23 Alvarado Ave., Worcester, MA 01604 (800) 343-0314; In Mass: (617) 756-2960

# Call toll free (800) 343-0314 In Mass: (617) 756-2960

Call if you're not sure which disk is compatible with your system. Call for prices on 96 tpi and special formats. We offer an unconditional money-back warranty. We're here to help.

Be sure to indicate system name and model # at right

of 0 Packs	5¼" Diśks	Price Per 10 Pack	Total Price
	Single side/single density	\$19.90	\$
	Single side/double density	\$23.90	\$
	Double side/double density	\$39.90	\$
	Flip/Floppy reversible Double side/double density	\$39.90	\$
	Protective plastic library case (in lieu of soft storage box)	\$ 2.99	\$
	Shipping and handling		\$ 1.50
	5% sales tax (Mass. only)		\$
		Total	\$

Circle 310 on inquiry card

□ Check □ COD	☐ Master Card ☐ VISA	
Card#	Exp.	
System and model #		
Name		
Address		
Tal		

Listing 9: The list program (%!LIST). The subroutines at lines 1000, 2000, and 5000 isolate interaction with the subexecutive program and the job-control file.

10 REM\* SAMPLE LIST PROGRAM (SAVED IN FILE '%!LIST')

20 REM\* 11/18/80 WRITTEN BY GENE F. WALTERS

30 GOSUB 1000 \REM READ IN GLOBAL DATA

40 GOSUB 2000 \REM READ IN LIST COMMAND DATA & INITIALIZATION

50 GOSUB 3000 \REM READ AN ENTRY FOR PRINTING

60 IF Z THEN 90 \REM TEST FOR END OF FILE

70 GOSUB 4000 \REM PRINT ENTRY

80 GOTO 50

90 GOSUB 5000 \REM PROGRAM WRAPUP & RETURN TO SUBEXECUTIVE

1000 REM\*----

1010 REM\* SUBROUTINE TO READ IN GLOBAL DATA

1020 REM\*-----

1030 DIM P\$(80),L(3)

1040 D1=0 \REM DEVICE FOR CONSOLE

1050 D2=1 \REM DEVICE FOR PRINTER

1060 D3=0 \REM DISK FILE FOR THE SYSTEM

1070 D4=1 \REM MASTER FILE

1080 U=3 \REM NO. OF DRIVES IN SYSTEM

1090 S\$="%!" \REM PREFIX FOR SYSTEM FILE NAMES

1100 FOR I=1 TO U

1110 US=CHR\$(I+48)

1120 IF FILE(S\$+"JCL,"+U\$)=3 THEN 1150

1130 NEXT I

Text continued from page 366: 2090 through 2110 then read in those

global data stored at the beginning of the job-control file.

2000-2130 Read in Parameters for Program Execution. Using the current-entry pointer near the beginning of the job-control file, lines 2040 through 2070 position to the entry containing the parameters for the update/sort program's execution. Lines

parameters.

7000-7070 Return to Subexecutive. This section of code first positions the paper when an error listing is produced. The code uses the current line number, L, and the number of lines per page, P5, to calculate the number of blank lines to print in order to eject the listing to a new page. As a result,

the printer should start at the top of a new page after each program's execution. Line 7070 CHAINs to the sub-

Listing 9 continued on page 380

#### The List Program

executive.

Listing 9 is the list program (%!LIST). Again, I will describe only those features of the list program that

Text continued on page 382

### **F** Back Issues For Sale

#### The following issues are available:

\$2.00 ea.	\$2.75 ea.	\$2.75 ea.	\$3.25 ea.
July 76	May 78	Oct. 79	Feb. 81
Apr. 77	June 78	\$3.25 ea.	Mar. 81
May 77	July 78	Nov. 79	Apr. 81
June 77	Aug. 78	Dec. 79	May 81
July 77	Sept. 78	Jan. 80	July 81
Aug. 77	Oct. 78	Mar. 80	Aug. 81
\$2.75 ea.	Dec. 78	Apr. 80	Oct. 81
Sept. 77	Jan. 79	May 80	Nov. 81
Nov. 77	May 79	June 80	Dec. 81
Dec. 77	June 79	July 80	\$3.70 ea.
Feb. 78	July 79	Aug. 80	Mar. 82
Mar. 78	Aug. 79	Oct. 80	
Apr. 78	Sept. 79	Dec. 80	



Prices include postage in the US. Please add \$.50 per copy for Canada and Mexico; and \$2.00 per copy to foreign countries (surface delivery).

Send requests with payment to:

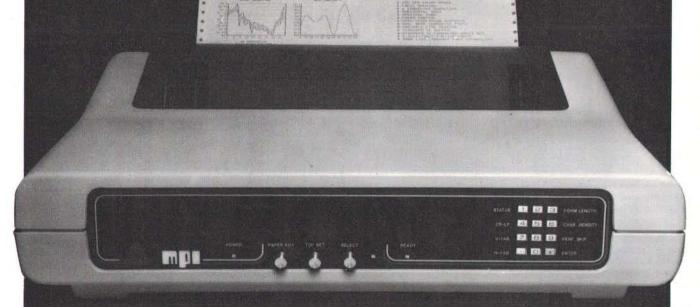
#### BYTE Magazine

70 Main St. Peterborough NH 03458 Attn: Back Issues

<sup>\*</sup> Payments from foreign countries must be made in US funds payable at a US bank.

<sup>\*</sup> Please allow 4 weeks for domestic delivery and 8 weeks for foreign delivery.

# WE'VE WIDENED OUR HORIZONS.



\*Suggested list price. Substantial OEM discounts available.



Micro Peripherals, Inc. 4426 South Century Dr Salt Lake City, Utah 84107 (801) 263-3081

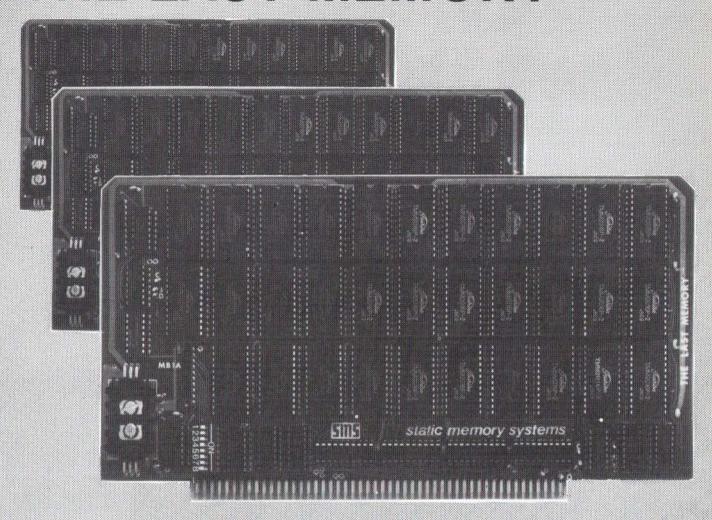
Arizona PLS Associates (602) 245-5477 • California VITEX (714) 744-8305 • Computer Potentials (408) 738-1740 • Colorado PLS Associates (303) 773-1218 • Florida Computer Village (305) 286-5965 • Georgia Micro Graphics (404) 790-5771 • Illinois CW Electronic Enterprises (312) 298-4830 • Massachusetts Butler Associates (817) 965-1080 • Consumer Computer Marketing (617) 443-5128 • Minnesota Bohlig & Associates (612) 922-7011 • New Jersey Hansen & Hughes (201) 552-7055 • Ohio EQS (216) 729-2222 • Oregon Microware (503) 820-8150 • Pennsylvania QED Electronics (215) 674-9900 • Texas Computer Wares (214) 373-4443 • Thoron Distributors (214) 233-5744 • Utah PLS Associates (801) 468-8729 • Washington Microware (206) 451-8586 • International: Europe Russet Instrument, Ltd. (0734) 888147 Telex 849721 • Australia Datatel Pty. Ltd. 690-4000 Telex: AA30996 • Canada Norango (416) 498-5332 Telex 06966710 • Mexico, Central and South America Siscom-trol (905) 689-02-09

```
1140 PRINT #D1, "COULDN'T FIND JOB CONTROL FILE." \END
1150 OPEN #D3, S$+"JCL,"+U$
1160 READ #D3, N, NO, N1 \REM-# CMD ENTRIES, CURRENT CMD, PTR TO 1ST ENTRY
1170 READ #D3.P$ \REM PASS OVER FIRST STRING
1180 READ #D3,D$,T$ \REM READ IN DATE AND TIME
1190 READ #D3, P5, P6, P7 \REM LINES/PAGE, TOP MARGIN, BOTTOM MARGIN
1200 READ #D3,L(1),L(2),L(3) \REM MAX LENGTH FOR TITLE, AUTHOR, DATE
1210 RETURN
2000 REM*-----
2010 REM* SUBROUTINE TO READ IN LIST COMMAND DATA & INITIALIZATION
2020 REM*-----
2030 DIM P1$(80), P2$(80), P3$(80), P(3), X1$(80), X2$(80), X3$(80)
2040 P2=N1
2050 FOR I=1 TO NO
2060 P1=P2
2070 READ #D3%P1, P2
2080 NEXT I
2090 READ #D3.P$,P$ \REM PASS OVER FIRST TWO STRINGS
2100 READ #D3,F1$,U1$ \REM FILE NAME & UNIT FOR MASTER
2110 READ #D3, P(1), P(2), P(3) \REM PRINT FIELD ORDER
2120 L1=L(P(1)) \REM LENGTH OF IST PRINT FIELD
2130 L2=L(P(2)) \REM LENGTH OF 2ND PRINT FIELD
2140 L3=L(P(3)) \REM LENGTH OF 3RD PRINT FIELD
2150 P=0 \REM INITIALIZE PAGE NUMBER COUNTER
2160 L=0 \REM INITIALIZE LINE COUNTER
2170 CLOSE #D3
2180 OPEN #D4.F1$+U1$
2190 RETURN
3000 REM*-----
3010 REM* SUBROUTINE TO READ AN ENTRY
3020 REM*-----
3030 Z=0
3040 IF TYP(D4)<>0 THEN 3060
3050 Z=1 \RETURN \REM END OF FILE
3060 READ #D4, X1$, X2$, X3$
3070 ON P(1) GOTO 3080, 3090, 3100
3080 P1$=X1$ \GOTO 3110
 3090 P1$=X2$ \GOTO 3110
 3100 P1$=X3$
 3110 IF LEN(P1$)>L1 THEN P1$=P1$(1,L1) \REM TRUNCATE IF TOO LONG
 3120 ON P(2) GOTO 3130, 3140, 3150
 3130 P2$=X1$ \GOTO 3160
 3140 P2$=X2$ \GOTO 3160
 3150 P2$=X3$
 3160 IF LEN(P2$)>L2 THEN P2$=P2$(1,L2) \REM TRUNCATE IF TOO LONG
 3170 ON P(3) GOTO 3180, 3190, 3200
 3180 P3$=X1$ \GOTO 3210
 3190 P3$=X2$ \GOTO 3210
 3200 P3$=X3$
 3210 IF LEN(P3$)>L3 THEN P3$=P3$(1,L3) \REM TRUNCATE IF TOO LONG
 3220 RETURN
 4000 REM*----
 4010 REM* SUBROUTINE TO PRINT AN ENTRY
```

Listing 9 continued on page 382

4020 REM\*-----

# THE LAST MEMORY™



# OFFERS MORE FOR LESS

THE LAST MEMORY", 64K static RAM/EPROM board, sets the industry standard in cost and performance. That's why it's the choice of system integrators, research laboratories, small businesses, large corporations, universities, and hobbyists from Dayton to Tasmania.

Now, how could we make the standard in \$100 memory boards better? BY LOWERING THE PRICE!!

		KIT	Γ	ASSEMB	LED & TESTED
Board Without RA	: K.A	99.99	00.00	1901	99_ 139.00
16K	/th:	219.99			239.00
				589	
64K		- <del>248-88</del> -	459.00	D0H-	9 <del>9-</del> 485,00

All boards supplied with 150ns RAM Any board configuration (i.e. ZK, 4x, .62K, etc.) available OEM discounts available. All prices are F.O.B. Freeport II Dealer inquiries invited



# Static memory systems Inc.

Freeport, Illinois 61032 (815) 235-8713





```
4030 GOSUB 4060 \REM PRINT HEADING IF REQUIRED
4040 PRINT #D2, P1$, TAB(L1+1), P2$, TAB(L1+L2+2), P3$
4050 RETURN
4060 REM*-
4070 REM* SUBROUTINE TO PRINT HEADING
4080 REM*-----
4090 IF L=0 THEN 4120
4100 L=L-1
4110 RETURN
4120 IF P=0 THEN 4160
4130 FOR I=1 TO P7 \REM BOTTOM MARGIN
4140 PRINT #D2
4150 NEXT I
4160 P=P+1
4170 FOR I=1 TO P6 \REM TOP MARGIN
4180 PRINT #D2
4190 NEXT I
4200 PRINT #D2, "ARTICLE/BOOK LIST", TAB(40-INT((LEN(D$)+LEN(T$)+2)/2)),
4210 PRINT #D2, D$," ", T$, TAB(73), "PAGE", %31, P
4220 PRINT #D2
4230 ON P(1) GOTO 4240, 4250, 4260
4240 PRINT #D2, "TITLE", TAB(L1+1), \GOTO 4270
4250 PRINT #D2, "AUTHOR", TAB (L1+1), \GOTO 4270
4260 PRINT #D2, "DATE", TAB(L1+1),
4270 ON P(2) GOTO 4280, 4290, 4300
4280 PRINT #D2,"TITLE", TAB(L1+L2+2), \GOTO 4310
4290 PRINT #D2, "AUTHOR", TAB (L1+L2+2), \GOTO 4310
4300 PRINT #D2, "DATE", TAB(L1+L2+2),
4310 ON P(3) GOTO 4320, 4330, 4340
4320 PRINT #D2, "TITLE" \GOTO 4350
4330 PRINT #D2, "AUTHOR" \GOTO 4350
4340 PRINT #D2, "DATE"
4350 PRINT #D2
4360 L=P5-P6-P7-5
4370 RETURN
5000 REM*---
5010 REM* RETURN TO SUBEXECUTIVE
5020 REM*----
5030 FOR I=P5-L-2 TO P5 \REM EJECT TO A NEW PAGE
5040 PRINT #D2
5050 NEXT I
5060 CLOSE #D4
5070 CHAIN S$+","+U$
```

#### Text continued from page 378:

relate to its overall structure and its use of the executive.

30-90 Overall Program Flow. I again used the approach of controlling program flow by using a series of GOSUB statements. The subroutines at lines 1000, 2000, and 5000 isolate interaction with the subexecutive and the job-control file.

1000-1210 Read in Global Data. These lines are similar to lines 1000 through 1270 in the update/sort program but do less processing after reading the parameters.

2000-2190 Read in Parameters for Program Execution. These lines read in parameters for executing the rest of this program.

5000-5070 Return to Subexecutive. After positioning the printer to a new page, this section transfers control back to the subexecutive.

#### Adapting for your Application

You can adapt these programs for your application in two ways. One is to retain the same basic functions in the system but change the fields to be

# APPLE, TANDY AND ALL THE OTHERS

"READ THE CHART AND SEE WHICH COMPUTER COSTS LESS AND GIVES YOU MORE FOR YOUR MONEY."

-WILLIAM SHATNER

<b>COMPARE OUR \$995 COMPUTER</b>				
FEATURES	COMMODORE 4016	IBM®	APPLE II®	TRS-80® MODEL III
Base Price	\$ 995	\$1565	\$1330	\$ 999
12" Green Screen	Standard	345	299	NO
IEEE Interface	Standard	NO	300	NO
TOTAL	\$ 995	\$1910	\$1929	\$ 999
Intelligent Peripherals	Standard	NO	NO	NO
Real Time Clock	Standard	NO	NO	NO
Upper & Lower Case Letters	Standard	Standard	NO	Standard
Separate Numeric Key Pad	Standard	Standard	NO	Standard
Maximum 5 <sup>1</sup> / <sub>4</sub> " Disk Capacity Per Drive	500K	160K	143K	178K

These systems were configured to approximate the capabilities of the 16K PET® 4016. Disk drives and printers are not included in prices. Models shown vary in their degree of expandability.

#### WHY COMMODORE

The idea of a computer in every office and home used to be science fiction. But that idea is now becoming reality.

The question is, with so many to choose from, which computer should you buy. When you consider the facts, the clear choice is Commodore:

1 Commodore is the only personal computer company with a full line of computers—from our \$299.95 VIC-20 to the economical PET® and CBM™ (see chart) to our new SuperPET computer that speaks 5 computer languages.

2 Commodore is the only U.S. personal computer company that manufactures its own semiconductor microprocessors-the "heart" of all personal computers. As a result, Commodore's computer system is more

As a result, Commodore's computer system is more affordable.

Commodore's proprietary "6502" microprocessor is so technologically advanced and reliable that it's used in Inventory control • Job costing • Engineering • Person
Accounts receivable • Accounts payable • Payroll • 3 ozz. was created by the Bristol Software Factory.

Inventory control • Job costing • Engineering • Person
4 MAS and LTA were created by Cimarron Corp. Commodore's proprietary "6502" microprocessor is all Apple and Atari computers, as well as many others. nel recordkeeping . Tax preparation.

Commodore's CBM provides more storage power— 1,000,000 characters on 5¼" dual disks—than any system in its price range. More than IBM. More than Apple. More than Tandy.

Commodore computer systems can be expanded to meet the needs of a growing business.

With over a quarter of a million computers sold worldwide, Commodore is proven for performance and reliability.

Sales in excess of \$200,000,000 annually 8 Commodore is listed on the New York

Stock Exchange.

USES AND APPLICATIONS Word Processing. It's easy on Commodore -the most versatile, efficient and economical computers in their price range.

Financial Planning and Budgeting. Through the use of VisiCalc™ 1, the electronic worksheet. It lets you explore all your financial alternatives in seconds.

Dow Jones Portfolio Management System<sup>2</sup>. Gives you up-to-the-minute data on over 6,000 securities. And more

Data Management and Retrieval System. OZZ3, our information wizard, makes it easy for you. Doctors' System. Our Medical Accounting System

(MAS)4 offers a fast, flexible billing and accounts receivable package. Legal Time Accounting System (LTA)4. Automatical-

ly processes activities by client, attorney and action.

#### WE WROTE THE BOOK ON SOFTWARE

The Commodore Software Encyclopedia is a comprehensive directory of software programs for:

 Business ● Education ● Recreation ● Personal Use Contains over 1,000 software applications to choose from. Pick up a copy at your local Commodore dealer.

#### FULL SERVICE, FULL SUPPORT

Commodore dealers throughout the country offer prompt local service. And our new national service contract with TRW provides nationwide support. TRW is the largest third-party related computer service organiza-tion in the U.S., with over 2,000 skilled technicians, nationwide.

1 VisiCalc is a Trademark of Personal Softwear, Inc.



## **CHOOSE...**

#### Choose an Apple Desk



A compact Bi-Level desk ideal for the Apple computer system. This 42" × 29½" desk comes with a shelf to hold two Apple disk drives. The top shelf for your TV or monitor and manuals can also have an optional paper slot to accomodate a printer. It is shown here with the optional Corvis shelf which will hold one Corvis disk drive. The Corvis shelf is available on the 52" × 29½" version of the Apple desk.

#### Choose a Micro Desk



The Universal Micro desk accommodates the S-100 type microcomputers. The desk is available in four sizes: 17.75 inch, 19.06 inch, and 20.75 inch wide openings with 24 inch front-to-rear mounting space. The fourth size is a 20.75 inch wide opening with a 26.50 inch front-to-rear mounting space.

#### Choose a Mini Rack



Mini racks and mini micro racks have standard venting, cable cut outs and adjustable RETMA rails. Choose a stand alone bay or a 48", 60", or 72" desk model in a variety of colors and wood tones. A custom rack is available for the Cromemco.

#### Choose a Printer Stand



The Universal printer stand fits the:

Centronics 700's
Dec LA 34
NEC Spinwriter
Lear Siegler 300's
Diablo 1600's & 2300's
T.l. 810 & 820
Okidata Slimline
Anadex 9500's

Delivery in days on over 200 styles and colors in stock. Dealer inquiries invited.

#### ELECTRONIC SYSTEMS FURNITURE COMPANY

17129 S. Kingsview Avenue Carson, California 90746 Telephone: (213)538-9601 maintained; the other is to use the structure and the supporting utility routines for an entirely different set of tasks.

As an example of the easier case, let's assume you want to maintain a directory of all your program and data files where each entry contains the following fields: disk identification, file name, type of file, date of last update, and description of file contents. This system has five fields rather than the three in the Article/Book Maintenance System. The lines of the programs to change are shown in table 1. As this example shows, you can retain much of the original system for the new application. But this system has a major limitation on the number of entries that can be maintained, because the entire file must be in memory for the sort process. Additional code could be written in the update/sort program to perform the sorting process on disk to remove this limitation.

Now let's look at how to adapt the batch-processing system for an application quite different from the original Article/Book Maintenance System. The MAIN program is made to be flexible. You can adapt it to meet the requirements of the programs that are to be incorporated; just set up the appropriate global parameters and parameters specific to the programs you want to use. This is done by deleting lines 3000 through 5230 from the MAIN program (see listing 6). Also change lines 100 and 360 to reflect the commands that you need. Determine all the parameters that will be used by two or more programs to be run in a batch. Then,

#### MAIN Program (Save in a file with a name of your choice)

Lines	Modification
3380-3460	Change for your options
4130-4580	Change for your options
5160-5210	Change for proper length of each field
64520	Change the name to one of your choice

#### Subexecutive (%!)

No change required

#### Update/Sort Program (%!SORT)

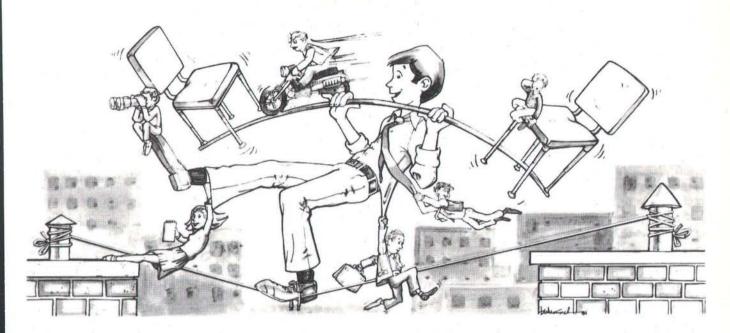
Lines	Modification	
1210-1240	Change for the different fields	
3080-3090	Change for the different fields	
4290	Provide more code for the two additional fields	
4310	Change 3 to 5 for the proper number of fields	
4325	Change for the additional two fields	
4395-4560	Change and provide more code for the two additional fields	
5040-5070	Change and provide more code for the two additional fields	
6090-6110	Change and provide more code for the two additional fields	

#### List Program (%!LIST)

Lines	Modification
1030	Change for additional fields
1200	Change for additional fields
2030	Change for appropriate length of print line
2110	Change for additional fields
2140	Provide more code for additional fields
3060-3210	Change and provide more code for the two additional fields
4040	Change for the additional fields
4200	Change for the appropriate heading and print line length
4230-4340	Change subheading

**Table 1:** Changes required to adapt the Article/Book Maintenance System for maintaining disk directories. This table shows the required changes in each of the batch-processing system's four programs, with line-number references in each.

### RM/COBOLTM1 MAKES IT ACROSS!



...FROM ONE OPERATING SYSTEM TO ANOTHER! A VITAL WAY TO PROTECT YOUR SOFTWARE INVESTMENT FOR THE FUTURE!!

The RM/COBOL language runs on more different Operating Systems and more

different-sized computers than any other similar language. For starters, it runs on NCR and TI minicomputers and, in the micro field, on the CP/M², MP/M², CP/M86², MP/M-86², TRSDOS³, OASIS⁴, MOASIS⁴, and UNIX⁵, (ONYX version) Operating Systems . . . to mention only a few.

Until now, serious business software of the scope and flexibility seen in the minicomputer world has not been available on micros. RA/COROL now allows transfer of such software with a minimum of fuss.

We have participated in such a mini-to-micro transfer of a major set of general business software . . . using RA/COBOL as the transfer mechanism, of course. Running on literally thousands of minicomputers, these refined, enhanced, and proven software packages cover A/R, A/P, G/L, P/R, Order Entry (with Invoicing and Inventory Control) as well as Sales Analysis. The Packages define a new level of achievement for features and flexibility in micro applications software and offer top quality at a reasonable price.

For immediate information, call 714/848-1922 for your complete product descriptions.

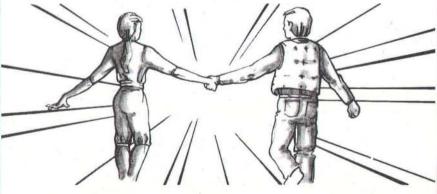
#### Trademarks of:

1-Ryan-McFarland Corp.; 2-Digital Research, Inc.; 3-Tandy Corp.; 4-Phase One Systems, Inc.; 5-Bell Telephone Laboratories, Inc.; 6-Cybernetics, Inc.



8041 NEWMAN AVE., SUITE 208 HUNTINGTON BEACH, CA 92647 714/848-1922

#### RM/COBOL and (RT! TM6 from CYBERNETICS ARE GOING STEADY...



#### .. AND YOU'RE GONNA LOVE 'EM TOO!!

Use your computer to program itself. (RT! (Gobol Reprogramming Too!!) from Cybernetics is a program generator for RA/COROL that produces error-free RA/COROL source programs for data input, file maintenance, and report printing programs.

A full feature interactive program generator, not a subset! Call Now! 714/848-1922.

# BUYNG

You can save on computers and software using our commercial buying service. We buy wholesale for you. Our fee is one fourth of what we save you off list. We offer you:

- Access to over 500 Manufacturers
- Leasing

Computers

- 1500 Satisfied Clients
- · Exporting Services

Examples of prices paid by our clients (including fee) are:

Adds Multivision	\$ 3,075.00
Adds Multivision I	3,074.00
Alpha Micro 1030	12,047.00
Alpha Micro 1051	17,634.00
Alspa AC1-2/SS	2,320.00
Altos 8000-02	2,629.00
Altos 8000-10	6,141.00
Altos 8000-15	3,585.00
Altos 8600-10	7,586.00
Apple 2 + 48K	1,208.00
- '이 존개하는 선생님이는 다시아요. 이는 경우 및 트리아 플레스 (Head) - 10 Head (	

Thomas increases	11,004.00
Alspa AC1-2/SS	2,320.00
Altos 8000-02	2,629.00
Altos 8000-10	6,141.00
Altos 8000-15	3,585.00
Altos8600-10	7,586.00
Apple 2 + 48K	1,208.00
Archives Model I	4,700.00
CCS Series 300-1A	4,414.00
Cromenco System 0	3,200.00
CromemcoSystem 1	2,946.00
CromemcoSystem 2	3,400.00
DEC VT-180xx	3,344.00
Dynabyte	30% OFF
IBM Personal	CALL
Micromation	CALL
NEC 8001A	750.00
NEC8012A	490.00
NEC8031A	750.00
North Star Advantage	2950.00
North Star Hoz II 64K DD	2,995.00
North Star Hoz II 64K QD	3,040.00
Onyx 5001 MU-6	7,350.00

Osborne

Seattle System 2

Televideo TS-802

Televideo TS 806

TelevideoTS-802H

Toshiba EW - 1000/4

Toshiba T-200 w/Printer

Toshiba T-250 w/Printer

Toshiba EW-1000/2 w/Ptr 5,999.00

Vector 2600	4,221.00
Vector 3005	6,458.00
Vector 5005	7,308.00
Wicat	CALL
Xerox 82051/4	2,300.00
Xerox 8208"	2,900.00

#### **Printers**

C. Itoh F-10	1.400.00
C. Itoh 40 CPS Serial	1,500.00
C. Itoh 45 CPS Par	1,675.00
C. Itoh Comet II	800.00
Diablo 630	1.965.00
IDS 560	1,099.00
IDS Prism 132 Column	1,395.00
NEC 3510	1,830.00
NEC 7710 R/O	2,325.00
NEC 7720 KSR	2,700.00
NEC 8023	603.00
Olivetti 231	2,104.00
Qume 9/35	1,795.00
Qume 9/45	2,045.00
Sellem 1	2,725.00
Tally	CALL

#### Others

Anderson Jacobsen	641.25
Corvus 10MEG	3,825.00
DEC VT-100	1,430.00
Houston Instrument DMF	-21,147.00
Houston Instrument DMF	41,460.00
Houston Instrument DMF	72,077.00
Morrow 20MEG	3,650.00

For latest wholesale prices and to order Call Toll Free 800-227-2288. In California call 415-376-9020. Assembly, integration and testing also available from our service department.

Ask about our Leasing Program. We are buying agents for overseas computer dealers. **EXPORT SERVICES available.** International Telex 470851.

CALL

3,251.00

2,600.00

5,000.00

5 100 00

4,099.00

5,099.00

6.799.00

Mastercard, VISA at 3% handling fee. Prices subject to change without notice. Minimum fee \$100, 15% cancellation fee.

#### HE PURCHASING AGENT

1635 School St., Suite 101, Moraga, CA 94556

using the utility routines found in lines 64000 through 65080, write a routine to set up the global parameters in the job-control file. This approach assures that if you want to change a parameter later, you will need to make only a simple modification in the MAIN program.

Next, again using the utility routines, write a routine for each command required. Remember the importance of checking that all parameters to be written to the jobcontrol file are reasonable. The Article/Book Maintenance System handles only string input. If you want to accept a numeric value, first read it in as a string, then call the routine at line 64990 to check for null input, and then convert the string to a numeric value by using the BASIC function VAL.

Finally, use the basic structure of the programs listed here as the model for the programs to be run under your batch-processing system.

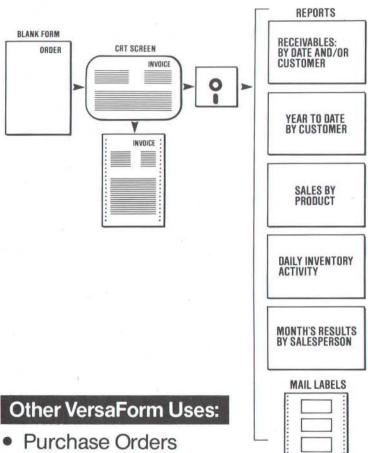
#### Conclusion

It is irritating to have to attend a computer and nurse it through a series of repetitive operations. After all, the computer is supposed to be a laborsaving and timesaving device, especially useful for repetitious tasks that people hate. But what will save you from the labor and time required to supervise and redirect the computer through a series of repetitions?

The answer is batch-processing software. Once you have a batchprocessing system working, you'll find that you can easily adapt it for various specific applications. While the computer works on one set of tasks, you will be free to concentrate on another, or simply relax. I hope that the batch-processing system that I have described proves as helpful to you as it has to me.■

The author will send interested BYTE readers a 51/4-inch, singledensity North Star disk containing the programs described in this article. The programs on the disk, which costs \$15, include both the Article/Book Maintenance System programs and the set of programs for maintaining disk directories.

# **BUSINESS FORM PROCESSING Application Memo #1: INVOICES**



- Professional Billing
- Inventory Ledgers
- Job Costing
- Personnel Records

Send for Application Note INV-01

VersaForm supports Apple II and Apple III. Hard Disk versions available **Now there's a way** to quickly automate specific areas of your business . . . using existing forms. In a single session you can emulate a standard invoice on a personal computer (as shown on side). Automatic filling, calculating and data checking features to speed error-free processing. It's called Business Form Processing, a brand new concept in desktop computing.

Producing management reports that used to take days now takes minutes. Just specify which items contained within your form are to be sorted, sub and summary totalled. Each report as shown took only minutes to specify, and minutes to produce. It's the combination of the easy-to-use reporting facility with its powerful forms emulator that makes VersaForm more than just a data base.

You can use existing forms. With a simple output formatting module, VersaForm lets you overprint processed information to a pre-printed form, or to blank paper that becomes its own custom form. It even customizes your output to your printer's line spacing and number of characters per line, and can omit confidential data from final customer drafts.

**If you have a form,** we've got the system and solution to higher productivity. Visit your local computer store where Apples are sold.

# **VersaForm**



Business Form Processor

Applied Software Technology 14125 Capri Drive Los Gatos, California 95030 (408) 370-2662

387

### **BYTELINES**

#### **News and Speculation about Personal Computing**

Conducted by Sol Libes

Random Rumors: IBM is expected to expand distribution of its Personal Computer in the second half of this year: look for distribution through channels other than Computerland and Sears. Reportedly, IBM is taking a look at mail-order and nonfranchised computer stores. It's also rumored that IBM is readving a smaller computer system designed specifically for mail-order sales and that the Pick operating system for the Personal Computer will be released soon. There's word of a deal between IBM and Motorola for the development of a 370/4300-computer-compatible system of software to run on Motorola's 68000.... Epson America is rumored to be developing a desktop personal computer for the low-end business market.... Software Arts, Cambridge, Massachusetts (the outfit that developed Visicalc) is said to be developing another revolutionary program for a leading hardware manufacturer. . . . Commodore is expected to finally release its 16-bit microprocessor that will be software compatible with the 6502.

are some of the new items that I expect to see introduced at the NCC show next month in Houston: look for Apple Computer Inc. to finally introduce the Apple IV using a 68000 microprocessor, a Unix-like operating system, sophisticated graphics, and networking functions. . . . Expect DEC (Digital Equipment Corporation) to finally

introduce its personal computer system based on the venerable PDP-8.... Look for Zenith to introduce its Z-100 16-bit computer system, rumored to use the Microsoft MS-DOS (the operating system used on the IBM Personal Computer).... Commodore will formally introduce its new personal computer that can emulate the Apple, Radio Shack, and IBM systems and run CP/M. ... I expect Xerox to introduce a portable version of its Xerox 820 computer/wordprocessor system. . . . Expect a 3.25-inch 3.3-megabyte "baby Winchester" disk drive from a U.S. vendor (check out the Sony, Monroe, Osborne, and Otrona booths for prototypes) and 51/4-inch hard-disk drives with 30megabyte capacity from Tandon and Control Data.... Epson is rumored to be readying a 1-megabyte, very thin 54-inch floppy-disk drive for showing at NCC.... Also, Integral Data Systems is expected to debut a dotmatrix printer with an 18-wire head to provide high-quality print.

rowing 68000 Market: As predicted several months ago in this column, Radio Shack has released its TRS-80 Model 16 using a 68000 16-bit microprocessor. Following in the footsteps of companies such as Godbout and Cromemco, the Model 16 is a dual-processor system that uses both an 8-bit Z80 processor and a 16-bit 68000 processor. This "hardware now, software later" strategy will allow purchasers to run Z80 software until 68000 software becomes available. Tandy expects to release a three-user (reportedly Unixlike) operating system over the summer and may have several languages available later. Applications software should be available starting in 1983.

Although the Radio Shack TRS-80 Model II has proved to be a very good single-user business system, the Model 16 represents a significant step upward for Tandy in its attempts to compete with IBM, DEC, et al., in the very lucrative multiuser business market. The Model 16 also offers options of an Arcnet local network interface, memory expansion up to 512K bytes and hard-disk storage.

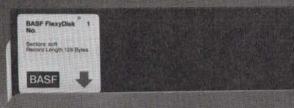
Rather than design a completely new computer from the ground up, as Apple is doing, Tandy has developed its Model 16 by adding the 68000 system to its Model II, replacing the single 8-inch floppy-disk drive with two slim-line drives (1.25 megabytes per drive), and changing the color of the cabinet from battleship gray to ivorywhite. The basic unit with 128K bytes of memory and 1.25 megabytes of disk storage lists for \$5000; however, if you want additional memory, a second floppy-disk drive, and a hard disk, you can expect a price of over \$10,000 (some Radio Shack dealers are already offering 15 percent discounts). Tandy also offers to upgrade Model II machines to most of the features of the Model 16 for \$1500-it's nice to see a company that doesn't forget its old customers.

Considering that Radio Shack's line of computers now ranges from tiny pocket computers to 16-bit multiuser systems, the next question is Will Radio Shack's next machine be a true 32-bit microcomputer?

Apple and PET users who want to upgrade to 16-bit processors need not feel left out in the cold. Several independent vendors are already offering plug-in and add-on 68000 and 8088 processor cards. For example, Digital Acoustics, Santa Clara, California, offers a 68000 processor card that can be attached to an Apple or PET for \$700 to \$1400, depending on the amount of additional memory (actually, the unit can be interfaced to any system via I/O ports and appropriate software). Metamorphic Microsystems, Boulder, Colorado, offers a card for the Apple that incorporates an Intel 8088, and also has available CP/M-86, MP/M-86, and UCSD Pascal 4.0. A 68000 Apple plug-in card is already being sold in England. (As yet, no software is available for the 68000 product.)

For almost a year now S-100 system owners have had 68000 processors available to them, with a variety of different multiuser Unixlike operating systems and development languages, from suppliers such as Empirical Research Group, Milton, Washington; MicroDaSys, Santa Monica, California; Dual Systems Control, Berkeley, California; and Cromemco, Mountain View, California. Already available

# len reasons why your floppy disk should be a BASF FlexyDisk.



More than four decades of experience in magnetic media - BASF nvented magnetic recording ape, the forerunner of today's wide range of magnetic media, pack in 1934, and was the first ndependent manufacturer of BM-compatible floppy disks.

ough Tyvek sleeve - no paper lust, no static electricity.

pecial self-cleaning jacket and ner help eliminate data errors nd media wear and tear.

Packaging to suit your

or bulk pack.

requirements - standard flip-top

box, Kassette 10® storage case,

Center hole diameter punched to more accurate standards than industry specifications, for top performance.

100% certification - every single disk is tested at thresholds 2-3 times higher than system requirements, to be 100% error-free.

**BASF FlexyDisk** 

Bi-axially oriented polyester

substrate-for uniform and reli-

able performance year after year.

Cross-linked oxide coating-for low head wear and long troublefree media life.

Total capability - one of two manufacturers in the world that makes both 8" and 5.25" models, has tape and disk experience, and manufactures floppy disk drives.

Double lubrication - lubricants both in the formula and on the disk surface, to minimize media wear due to head friction.

For the name of your nearest supplier, write BASF Systems, Crosby Drive, Bedford, MA 01730, or call 617-271-4030.



Floppy Disks Mag Cards Cassettes Computer Tapes Disk Packs Computer Peripherals

Circle 38 on inquiry card.

for these systems are languages such as Pascal, FORTH, FORTRAN, and BASIC. Prices for these systems are equal to or less than the Radio Shack prices.

Several other 68000-system suppliers are already delivering 68000 systems at under \$5000. Most notable are the Fortune 32:16 (already in Computerland stores) and the Sage II from Sage Computer Technology, Reno, Nevada, starting at \$3600.

Apple Computer's 68000 machine, which will not become available until the second half of the year at the earliest, will encounter a highly competitive 68000 marketplace. It will have to be darned good to compete.

**BM Doings:** Like every other personal computer

manufacturer, IBM underestimated the market for its product. It initially expected to sell about 100,000 units this year, but the company has greatly expanded its manufacturing facilities and now is expecting to ship 200,000 Personal Computers, thus generating between \$500 and \$600 million in revenue (which should still be a small fraction of IBM's total yearly \$30 billion revenue). This should make IBM number three in the personal computer marketplace, following Apple Computer Inc. and Radio Shack (both companies are expected to ship over 300,000 systems this year). In fact, just about every personal computer manufacturer expects to set records this year. In the meantime, many IBM customers must wait as long as two months for delivery.

Sales of the IBM Personal Computer are currently limited to the U.S., although some dealers are reshipping to dealers outside the U.S. However, IBM is expected to start shipping to foreign dealers before the year is out.

Although users are generally pleased with the Personal Computer, there are some complaints: users say IBM has not made it easy to expand its system with additional memory and accessory devices, that the keyboard differs from IBM's conventional keyboards, that the system takes up more desk space than competing systems, that competitors can match or even exceed the IBM's performance in many areas, and-the biggest complaint-that the few programs available are too complex. Also, IBM hampered independent suppliers of addon peripherals by not releasing technical information until several months after the unit was released.

There are rumors that IBM will introduce a new, lower-cost personal computer later this year or in early 1983. Also of interest is the fact that Telesoft, San Diego, California, recently demonstrated its new Ada compiler on an IBM Personal Computer enhanced with 256K bytes of memory and a 6-megabyte hard-disk drive.

AT&T and IBM: The Justice Department, after many years of pursuit and incalculable expense, has finally settled its antitrust suit with AT&T and dropped its suit against IBM. This means that AT&T is now free to become a formidable competitor in

# BUY A 212A-TYPE MODEM AND GET A \$212 REBATE.

Now, as an introductory offer, when you buy Cermetek's new fully-featured Bell 212A compatible modem, the CERMETEK 212A, you'll get a \$212 rebate.

Just consider the CERMETEK 212A's features:

- Integral Auto-Dialer
- 0-300 or 1200 BPS Operation
- Bell 212A Compatibility. Bell 103/113 compatibility or 0-300 BPS mode
- Auto-originate/Auto Answer/ Auto-Speed sense
- User option menu
- Full Duplex operation
- Seven (7) diagnostic modes
- One year limited warranty



To get your CERMETEK 212A modem, contact:

A.C.T. Rocky Mountain 2640 Youngfield Lakewood CO 80214 (303) 233-4431 A.C.T. 15800 Addison Rd. Addison TX 75001 (214) 980-1888

P & L Associates 11 Laura Lane P.O. Box 481 East Setauket NY 11733 (516) 221-7623

Offer expires September 30th, 1982. Limited to two modems per customer.

ompu

ALL MAIL: P.O. Box 1380, Jacksonville, OR 97530 WAREHOUSE AND OFFICES, BY APPOINTMENT AT 6791 APPLEGATE ROAD.

Ad# 931B

## apple supply center

HARDWARE Apple 11/11+ **CLOSEOUT** on Apple Computer, Inc. products

Apple II 48K or 64K Apple III 128K Disk Drives, II and III Profile III, Hardisk Interface Carde SAVE CALL \$2750 22% Silentype II or III Up to 25%

Direct Substitute for Apple Drives Micro-Sci A2 is a direct substitute for Apple II' drives. It will run all Apple II software. Save \$350 on a dual A40 disk system Micro-Sci 5" Drives for Apple II A2 Drive, 5", 143K 18% \$ 95 15%

EW (

A2 Drive, 5", 143K Controller with DOS for A2 A70 Drive, 5", 286K A40 Drive, 5", 160K Controller Card for A70 or A40 \$ 489 20% \$ 369 \$ 79 21% Sorrento Valley \* Disk Drive Controller 2+2 \$ 199 60% SAVE MONITORS: 12" Color 12" Green 24% NEC \$ 169 22% 9" B&W 9" Green 12" B&W SANYO-\$ 149 \$ 159 31% \$ 219 30%

12" Green \$ 229 30% 13" Color 12" Green 28 % 20 % ZENITH DISKETTES, 5", box of 10: \$ 39 \$ 25 Maxell Memorex 45% 80 COLUMN VIDEO CARDS: \$ 249 Videx Videoterm M&R Sup R Term \$ 295 22%

ALS: Smarterm \$ 269 30% MISCELLANEOUS: SAVE CCS: Serial Interface 7710A \$ 139 22% Parallel Interface 7720A Other CCS Cards In Stock, \$ 99 20% CALL CALI Haves: Micromodem II \$ 289 25% Smartmodem \$ 229 20% 23% ISC Videostick Paddle \$ 35 Keyboard Company: 10% 17% 21% 27% 25% Joystick II Game Paddle Numeric Keypad \$ 45 25

M&R: RF Modulator

\$ 119 \$ 25 \$ 39 SUPRFAN Microsoft: Z80 Softcard \$ 279 33% 16K RAM Card Mountain: 13% 15% \$ 209 CPS Multifunction Card Clock/Calendar Novation Applecat Modem \$ 329 16% Orange Micro Grappler
Dan Paymar LCA New rev. \$ 129 21% \$ 34 33% Saturn System 32K RAM Card \$ 149 36%

64K RAM Card \$ 375 12% 128K RAM Card \$ 525 VC-Expand for Visicalc \$ 75 25% SSM AIO Serial/Para, Interface \$ 159 20% ALS: Smarterm 80 Col Card \$ 269 30% Z-Card (Z-80) Addram 16K Card \$ 209 \$ 119 22% 20% 27% Synergizer Package \$ 549 \$ 249 28% Videx Videoterm 80 col. Soft Video Switch 25 29%

Enhancer II Full Videx Line, Call 99 99 34% up to 35% Fan Fold, Call for sizes, thickness and prices PAPER:

LETTER QUALITY PRINTERS: SAVE Letter quality printer Sprint 9 45RO \$ 2195 23% \$ 2395 20% Sprint 5 45RO NEC 3510 RO Serial \$ 1995 20%

Olympia (Typewriter/Printer) ES-100, 18CPS, with full cable and interface to Apple II \$1695 22%

PRINTERS: Epson, See special Epson section at right Intergral Data

Prism 132, Color Printer w/Graphics \$1695 16% Prism 80, B&W, ASF, W/Graphics \$ 995 12% 445 Tiger W/Graphics & 2K \$ 695 23% 560 Tiger W/Graphics \$ 1095 22% Okidata Microline 82A \$ 495 25%

#### ORDERING INFORMATION:

Minimum order \$100. Cashiers Checks and Money Orders welcomed. Personal Checks allow 20 days to clear. Add 3% for shipping, insurance and handling. UPS is standard. Additional 7% for US Postal or APO. Additional 3% for VISA or MC. Include telephone #. No COD. Prices subject to change and typo errors. Call to verify.Order desk hours are 8 to 6 PDT, 10 to 3 Saturdays.

CLOSEOUT on Apple Computer, Inc. products SOFTWARE on disk for Apple 11/11+

Apple Software: SAVE 30% 21% Infocom Zork II 5 29 30% Apple Plot The Controller 91.0 Info Unlimited, Easywriter (PRO) The Controller
Dow Jones News & Quotes \$ 69
\$ 39 25% \$ 139 28% 22% Innovative Apple Spellguard CP/M Microcourier Many others \$ 189 CALL 24% CALL \$ 219 26% Insoft: Electric Duet NEW \$ 25 20% Artsci Magic Window \$ 75 25% ALD System II or III TransFORTH II or III \$110 10% Ashton-Tate CP/M
dBase II for Apple II
Aurora Systems \$ 495 Insoft Accountant CP/M GraFORTH NEW! \$ 355 66% Executive Secretary-WP \$ 69 25% \$ 189 \$ 18 25% Beagle Bros. DOS Boss LJK Letter Perfect \$ 112 25% **Broderbund Software** Micro Lab Payroll \$ 269 30% General Ledger Apple Panic Arcade Machine Data Factory, ver. 5.0 \$ 249 20% \$ 349 30% Invoice Factory 21 30% Tax Manager \$ 95 38% 32 30% 21 18 Micro Pro all CP/M Red Alert 30% 36% 36% 36% Space Warrior Word Star \$ 239 30% Many Others In Stock Mail Merge \$ 79 \$ 159 CALL CALL Budgeco, Raster Blaster Spell Star \$ 22 27% Data Star \$ 189 36% Calf. Pacific, Ultima \$ 30 25% Calc Star Super Sort \$ 189 \$ 129 36% 36% Central Point Software: Copy II Plus ver. 4 \$ 35 10% Will copy most copy protected software for your backup in 45 seconds! NEW 10% Microsoft A.L.D.S. \$ 110 10% **BASIC Compiler** \$ 299 \$ 559 \$ 149 25% 25% **Continental Software** Cobol 80 Fortran 80 Home Accountant Home Money Minder \$ 56 \$ 26 56 Olympic Decathlon \$ 24 24% Data Most Snack Attack Thief TASC Compiler Typing Tutor II \$ 159 22% \$ 22 25% 25% Denver Software Super Text II \$113 25% Financial Partner \$ 185 Epson, MX 80 Graphics Dump \$ 9 \$ 185 25% Castle Wolfenstein \$ 23 30% Robot War-On-Line 25% Hayden, Sargon II (chess) 22% Expediter II Superscribe II/Screen-\$ 75 25% Apple Pie (specify brd.) \$ 99 25% High Technology 27% writer II 95 Lisa 2.5 Pegasus II Threshold Store Manager Job Control System 25% 40% 59 22 26% 25% \$ 469 **Howard Software** 30 25% Tax Preparer Real Estate Analyzer 26 15 19 Cranston Manor 25% 25% \$ 115 25% \$ Mission Astroid Mystery House Creative Financing 25.94

Free gift with your order if you mention this ad

Osborne (Disk and Book) Some Common Basic Programs, 75 Business, Statistics and Math SAVE programs for the Apple II Peachtree Software all CP/M 50% \$ 49 37% Magic Wand GL. AR. AP. PR or Inv 38% Personal Software/VisiCorp SAVE VisiCalc 3.3 \$ 189 25% 25% VisiDex \$ 189 VisiFile \$ 189 25% Desktop Plan II VisiPlot 25% 20% \$ 189 Desktop Plan III \$ 209 30% VisiSchedule \$ 239 20% VisiTrend and VisiPlot VisiTerm \$ 79 \$ 33 20% Zork Softech Int'I 60% 30% Stockfile Stockseller Software Publishing: \$ 89 \$ 69 \$ 69 PFS II (NEW) 26% 26% 26% PES III Report II or III Sorcim Supercalc CP/M 25% Stoneware. DB Master (new version) \$ 179 22% Sub Logic Flight Simulator \$ 28 20%

#### OTHER BRANDS IN STOCK:

Accent, Adventure International, Astar, Auto, Simm., Avalon, Avant-Garde, Beagle, CPU, Cavalier, Datasoft, Delta, Edu-Ware, Info Com, Lazer, LJK, Phoenix, Quality, Sensible, Sentient, Sirius, Strategic, Synergistic and United

#### CP/M Software 8" and 5"

All Ashton-Tate, Insoft, Micro Pro, and Peachtree CP/M software available for most 5" and 8" drives, and computers at similar discounts.

3101-10 CLOSEOUT

SAVE 30%

CLOSEOUT COMPUTER SYSTEMS

8000-15 208K, 4 User, 2 Disk Drives \$3995 20% MTU-1 Tape Backup for Hard Disk \$2795 25% 8000-10 208K, 4 User, 10 Meg \$6495 25% Others in Stock CALL CALL

#### (x commodore VIC 20 Home Computer

\$ 249 16%

	1	
Full Accessories and Software Line	CALL	CALL
H/P 41CV Calculator 2.2K	\$ 245	25%
H/P 41C Calculator	\$ 185	25%
H/P 7470A Graphics Plotters	\$1249	19%
H/P 7225B Professional Graphics Plotter	\$2060	25%
H/P 82901M 5" Dual Drives	\$1650	27%
H/P 125 CP/M Microcomputer NEW!	\$1995	27%
H/P 87 CP/M Microcomputer NEW!	\$1995	20%
H/P 85 Microcomputer/Mcniter/Printer	\$1995	27%
PACKARD		SAVE
ho HEWLETT HIP 85A	\$ \$1,9	195

ATARI\*

800 16K \$ 666 17% 400 16K \$ 333 26% Microtek 16K RAM \$ 75 25% Microtek 32K RAM 25% 410 Recorder \$ 79 17% 810 Disk Drive \$ 449 26% 850 Interface \$ 169 25% Other Hardware 20 to 30% Full Line of Software 25% Visicalc \$ 159 21% Pac Man Avail 5/82 \$ 34 25% \$ 345 Communicator Kit 25% \$ 129 27% Educator Kit

DATA SYSTEMS

**VLIO7** 

SUPERBRAIN 64K QD

While They Last

30%

\$ 2795

PRINTERS

MX80 \$ 449 31% MX80 F/T \$ 555 25% MX100 F/T w/graphics \$ 729 27% 70/80/100 Apple Interface and Cable \$ 95 15% MX80 Friction feed adapter \$ 59 22% \$ 79 MX80 Graftrax Chip 20%

Microcomputer

8001 32K Computer \$ 750 25% 286K Total Dual Drive PC8031 \$ 750 25% 32K addon and I/O Unit PC8012 24% \$ 495 \$ 495 Ren Tec "The Wedge" 32K 8023 Impact Printer F/T 17% \$ 595 25% Impact Printer Cable 49 25% 3510 Letter Qual. Printer NEC PC Software \$ 1995 20% CALL CALL

Corvu CLOSE OUT

NO SALES TAX

(503) 772-3803

Oregon Order Desk

5 Meg Hard Disk 10 Meg Hard Disk 20 Meg Hard Disk Omni-Net. Constellation, Mirror, In Stock

\$ 2995 21% \$ 5245 20%

VISA

Apple is a registered trademark of Apple Computer, Inc.

Free gill STAR INDICATES **BEST BUYS** 

REFERENCES:



Ad# 931B

TOLL FREE We have been a computer dealer since 1978. Our bank reference is First Interstate Bank (503) 776-5620. We belong to the Chamber of Commerce, (503) 772-6293



NATIONAL ORDER DESK

Circle 92 on inquiry card.

the nonregulated computer/ communications marketplace. To grasp the potential impact of this decision, consider that last year AT&T's Bell Laboratories spent \$1.6 billion on research and development - more than the total amount spent by Japan's Ministry of International Trade and Industry.

Last year alone Western Electric, AT&T's manufacturing arm, produced more 64K-bit dynamic-memory integrated circuits than any other U.S. supplier and is already producing the MAC-32 32-bit microprocessor. Bell Labs has already disclosed the design of a 256K-bit dynamic-memory chip. Consider also the attention the industry is focusing on Unix. AT&T's Advanced Communications Service, scheduled to go online shortly, promises to

tie together computers, networks, and communications terminals in an incredibly advanced and massive computer operation.

IBM is free to pursue the same path. The company has already reentered the timesharing business and is spending about 10 percent of its revenues (almost \$2 billion) on research.

pple Dolngs: After failing in the courts to cancel Apple Computer Inc.'s ban on mail-order sales, one of the six mail-order dealers cut off by Apple has filed a formal complaint with the Federal Trade Commission, charging Apple with price fixing and violation of the Sherman Antitrust Act. In the meantime, mail-order sales continue from nonauthorized

10

100

100

1

Apple dealers who buy their units from authorized Apple dealers and still manage to offer discounts.

Apple finally appears to have gotten the Apple III off the ground by cutting the price by \$400, increasing the dealer margin to 33.4 percent, offering a new, sophisticated operating system and seven application software packages (including CP/M), and making significant hardware improvements and options (including a built-in 5megabyte hard disk). Reportedly, only 10,000 of the original Apple IIIs were sold compared to more than 350,000 Apple IIs sold through the end of 1981.

Word has it that Apple has spent \$30 million in the development of its two new microcomputer systems, which it hopes to formally announce at NCC. Apple has kept tight wraps on information about these two units; however, rumors abound that one, called "Lisa," is intended for the business market and will be a workstation system using a 68000 processor. It should have a Unix-like operating system, hard disk, 128K bytes of memory, Ethernet interface, and a base price of at least \$5000. The second system is rumored to be a low-cost portable system that will be softwarecompatible with the Apple II. It has been designated the "Super II." One question is What will happen to the Apple II and III when these new units are released?

Silm-line Floppy Race Heats Up: The slim-line 8-inch floppy-disk drives are

### Marymae industries, inc.

In Texas Orders **Ouestions & Answers** 1-713-392-0747

21969 Katy Freeway Katy (Houston) Texas 77450

To Order 1-800-231-3680 800-231-3681

#### SAVE BIG DOLLARS ON ALL TRS-80° HARDWARE & SOFTWARE

TRS-80° BY RADIO SHACK. Brand new in cartons delivered. Save state sales tax. Texas residents add only 5% sales tax. Open Mon.-Fri. 9-6, Sat. 9-5. We pay freight and insurance. Come by and see us. Call us for a reference in or near your city. Ref: Farmers State Bank, Brookshire, Texas.

#### WE OFFER ON REQUEST

Federal Express (Overnight Delivery)

Houston Intercontinental Airport Delivery (Same Day)

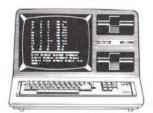
U.P.S. BLUE (Every Day)

References from people who have bought computers from us probably in your city

\* TRS-80 is a Registered Trademark of Tandy Corp

**ED McMANUS** 





In stock TRS-80 Model II and III

No Tax on Out of Texas Shipments!

Save 0% 15% OR MORE

Reserve Your Model 16 Today

Telex 77-4132 (Fleks Hou)

#### **WE ALWAYS** OFFER

- NO extra charge for Master Card or Visa.
- We use Direct Freight Lines. No long waits.
- We always pay the freight and insurance
- ✓ Toll free order number.
- Our capability to go to the giant TRS-80° Computer warehouse 5 hours away, in Ft. Worth, Texas, to keep you in stock.

JOE McMANUS



# GENERAL LEDGER?

# VERSA-LEDGER

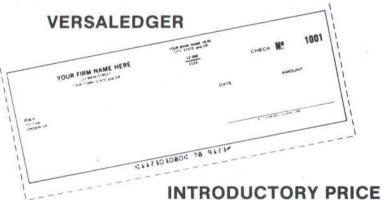
- \* THE ULTIMATE PERSONAL CHECK REGISTER
- \* A PROFESSIONAL ACCOUNTING SYSTEM
- \* A PERSONAL FINANCIAL MANAGER
- \* A SMALL BUSINESS ACCOUNTING SYSTEM
- \* A COMPLETE GENERAL LEDGER

FOR YOUR TRS-80 MODEL I, II , III or COLOR COMPUTER • APPLE II • I.B.M. • XEROX • ATARI ALL MICROSOFT BASIC COMPUTERS

#### HOW IT WORKS

**VERSALEDGER** is a complete accounting system that grows as you or your business grows. To start, your VERSALEDGER acts as a simple method of keeping track of your checkbook. Just enter your check number, date and to whom the check is made out to. As you or your business grows, you may add more details to your transactions . . . . account number, detailed account explanations, etc.

- VERSALEDGER can give you an instant cash balance at anytime. (IF YOU WANT IT TO)
- · VERSALEDGER can be used as a small personal checkbook register. (IF YOU WANT IT TO)
- VERSALEDGER can be used to run your million dollar corporation. (IF YOU WANT IT TO)
- VERSALEDGER prints checks. (IF YOU WANT IT TO)
- VERSALEDGER stores all check information forever. (IF YOU WANT IT TO)
- VERSALEDGER can handle more than one checkbook. (IF YOU WANT IT TO)
- VERSALEDGER can be used to replace a general ledger. (IF YOU WANT IT TO)



\$**QQ** 95

- VERSALEDGER HAS AN ALMOST UNLIMITED CAPACITY . . . .
  - (300 checks per month on single density 51/4" disk drives such as the TRS-80 Model-I)
  - (500 checks per month on the Apple II)
  - (2400 checks per month on the TRS-80 Model III)
  - (6000 checks per month on the TRS-80 Model II)
  - (3000 checks per month on single density 8" CP/M)
- VERSALEDGER will soon have an add-on payroll package. (IF YOU NEED IT)
  - CAN BE USED WITH 1 or MORE DISK DRIVES —

#### VERSALEDGER HAS BEEN CREATED THE FIRST TIME COMPUTER USER IN MIND

50 N. PASCACK ROAD SPRING VALLEY, NEW YORK 10977

ADD \$3.00 FOR \$HIPPING IN UPS AREAS ADD \$4.00 FOR C.O.D. OR NON-UPS AREAS ADD \$5.00 TO CANADA AND MEXICO ADD PROPER POSTAGE OUTSIDE U.S., CANADA & MEXICO



**NEW TOLL-FREE** ORDER LINE (OUTSIDE OF N.Y. STATE)

(914) 425-1535

(800) 431-2818

\*\*\* ALL PRICES & SPECIFICATIONS SUBJECT TO CHANGE \*\*\*

the first major redesign of this hardware to have occurred in several years. These drives are typically half the height of a standard drive. This makes it possible to double storage capacity without changing the cabinet, because you can stack two slim-line drives in the space previously occupied by one standard drive. Furthermore, manufacturers have reduced the length of the new 8-inch drives by at least two inches.

The genesis of the slim-line design is credited to Micro Peripherals, Chatsworth, California, which introduced the first slim-line drive in the spring of 1980 but did not start shipping until November of that year. Tandon, also in Chatsworth, introduced a slim-line drive at last year's NCC show and has since introduced a double-sided version. Tandon is currently the

only high-volume supplier of these drives. Shugart Associates has introduced an 8-inch slim-line drive, and Siemens is expected to show prototypes of its drive at NCC next month. At least six Japanese suppliers are expected to show 8-inch slim-line drives at NCC, many of which are already being delivered in Japan.

Although prices for the slim-line drives are currently higher than standard drives, these prices are expected to fall quickly as manufacturers gear up to full production. In the long run, prices are expected to be significantly lower than standard drives because manufacturers are further along the learning curve in design and manufacturing techniques.

Last year saw a turning point in the floppy-disk market as shipments of 51/4-inch drives overtook shipments of 8-inch drives. Although the new slim-line 8-inch drives are expected to bolster sales of 8-inch drives in general, they are not expected to significantly affect 51/4-inch shipments. Estimates for 1982 are that 1.9 million 8-inch and 3 million 51/4-inch drives will be shipped.

Incidentally, a reported 250 million disks were sold through the end of 1981; 125 million were sold in 1981 alone.

Icrocomputer Profits: Apple Computer reported that its net income for the first quarter of 1981 rose 83 percent to \$13.6 million on revenues of \$133.6 million. But that's nothing compared to Atari! Warner Communications, which owns Atari, reported that Atari sales last year doubled to \$1.2 billion, while income quadrupled to \$287 million. Incidentally, when Warner bought Atari in 1976, sales were about \$40 million-Warner is reaping a video game bonanza. Corvus Systems reported that its sales for 1981 more than quadrupled over the previous year, from \$2.7 million to \$11.4 million. Corvus is now two and a half years old.

Exxon Corp., which for the last few years has attempted to establish itself in the microcomputer field (with Zilog, Vydec, et al.) reported that its Office Systems subsidiary lost \$76 million in 1981—oh well, I guess Exxon needed a big tax loss.

Personal Computers: The Dvorak typewriter keyboard configuration has long been recognized as considerably more efficient than the conventional QWERTY keyboard configuration. Unfortunately,

the conventional configuration has been with us for many years and changing it is assumed to be difficult and expensive; however, owners of personal computers whose keyboards are software controlled can make the change easily by changing the software which scans the keys, and recent studies show that increased production more than balances the slight effort required. Software is already available for the TRS-80 Models I and III, Apple II, and Exidy Sorcerer microcomputers. People who are interested in reconfiguring their personal computers to use the Dvorak keyboard configuration should contact Quick Strokes (the newsletter for Dvorak keyboard users), POB 643. West Sacramento. CA 95691.

Record: Sharp Corp., Osaka, Japan, has disclosed that it has developed a videodisc system with recording capability. Based on a thermomagnetic effect, it employs a silicon laser and a 5¼-inch disk, similar to a floppy disk, that can store up to 200 megabytes. The unit is expected to be in production within two years.

**Foreign Exchange:** If you're into computer bulletin boards and are tired of accessing U.S. bulletin board systems, why not try a foreign BBS such as FORUM-80 London (01-286-6207), CBBS-London (01-286-6207), or FORUM-80 Holland (010-313-512-533).

**Ilegal Access:** Before the FBI and the courts put him out of business, a California teenager developed a hobby of illegally accessing computer systems. He had ac-

# BDOS ERROR ON B:BAD SECTOR



Before disk errors ruin your work again order BADLIM.

- BADLIM assures the reliability of your CP/M computer.
- You can use your disks 10 times longer without losing your data AND your time.
- BADLIM checks thoroughly your disk marking all the blocks which have defective sectors. The operating system will know that those sectors should be skipped.
- BADLIM is the only program that gives protection for soft and hard errors.
- The first time BADLIM will list which files in your disk are on bad sectors, so you can take action to correct it.
- But thereafter the bad areas in your disk will be automatically by-passed.
- For CP/M 1.4 single density and for CP/M 2.xx of any format and density. It is a must for Winchester as the media cannot be replaced.

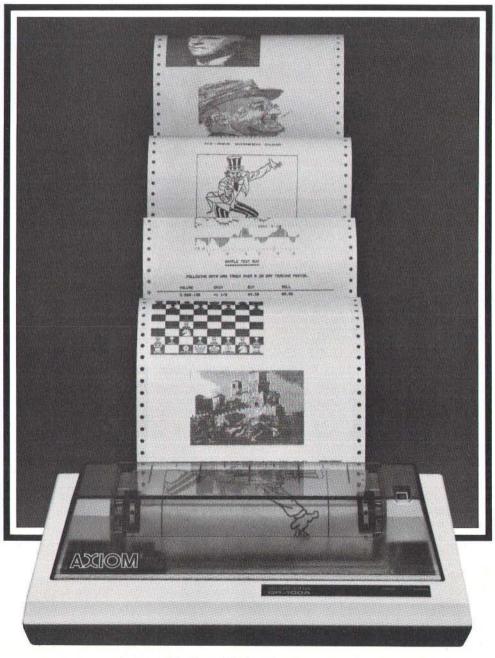
BADLIM cost only \$73. Whatever the reason you have to use a computer you need BADLIM. Contact your dealer or call us today:

BLAT R&D Corp., 8016 188th. St SW, Edmonds
WA 98020. Phone: [206] 771-1408
DEALER INQUIRIES INVITED.
BADLIM

May 1982 © BYTE Publications Inc

# \$389.

Made by Seikosha, AXIOM's new GP-100 is the finest printer a little money can buy. It uses standard 8-1/2 x 11 paper and has AXIOM's fabulous graphics interfaces for Apple, TRS-80, Atari, PET, HP and more! See the GP-100 at your AXIOM dealer today!





Seikosha is the leading company of the worldwide Seiko Group.

1014 Griswold Avenue, San Fernando, CA 91340 • Telephone: (213) 365-9521 • TWX: 910-496-1746 Circle 36 on inquiry card.

AXIOM CORPORATION

cessed computers belonging to U.S. Leasing, UCLA, UCA, DEC, and even law enforcement agencies. How did he do it? How did he get the access codes and passwords? Some he got by going through printouts he found in company trash cans, some by trial and error, and others by posing as a law officer or computer repairman. Why did he do it? "Just for kicks!"

Computers and the Handicapped: Microcomputers are being used in many ways to help the handicapped help themselves to become more effective in the job market, more independent as individuals, and able to coexist with nonhandicapped persons on a more equal basis. A new organiza-

tion to help this effort is "Computers to Help People," Madison, Wisconsin, founded by John Boyer, a grad student in computer science who is both deaf and blind.

ntel Upgrades 8086:
Intel has introduced a new microprocessor, called the 80286, that is software-compatible with the company's 8086 16-bit microprocessor. The new processor has an onchip multilevel protection mechanism as well as capabilities for memory management and virtual-memory address translation. Thus, it's targeted for the multiuser and multitasking market. The integrated circuit has 68 pins.

Another upgrade that Intel is expected to release shortly

is to be called the 80186. It will have on-chip clock and interrupt controllers, two DMA (direct memory access) channels, timers, counters, and random chip-select logic.

Unix Rumors: Tandy is expected to announce at NCC a Unix-like operating system for its new TRS-80 Model 16. Experts are betting that it will be Microsoft's Xenix. Rumors also suggest that Xenix will be implemented on the IBM Personal Computer and National Semiconductor's new 16-bit microcomputer . . . . Word has it that Unix IV with the Writer's Workbench is being readied for release to commercial customers early next year . . . Unix System V is reportedly being tested by AT&T and is expected to be adopted internally in about six months.

andom News Bits: Mattel Electronics has a new microcomputer game called Dallas. The processor, when playing the role of J.R., has been programmed to cheat, lie, and blackmail . . . Ithaca Intersystems' new version of Pascal/Z (version 4.0) has a unique feature: an interactive symbolic debugger called Swat. . . . If your rug is creating static problems with your computer, try spraying the rug with a mixture of twothirds Downey Fabric Softener and one-third water in a spray bottle....M/A-Com's purchase of Ohio Scientific Inc. seems to have determined Ohio Scientific's moving from the personal computer market to the business computer market-I note that the name of Ohio Scientific has been changed to "M/A-Com Office Systems Inc."... According to a report from Market Venture Consultants, Newport Beach,

California, 20 percent of all personal computers sold today are used in business, and this should increase to over 30 percent by 1985.... Disk Trends, another marketing research organization, predicts that the 31/2-inch floppy-disk drive is likely to become a major product, especially in office machines. It also predicts 31/2-inch Winchester drives with 5-megabyte capacity in volume production by 1983... Pertec Computer has given up manufacturing floppy-disk drives to concentrate on higher-margin tape and Winchester disk-drive products... Lifeboat Associates has released CP/Emulator, a program that will allow software written with it to run under CP/M-86 and under Microsoft's MS-DOS (used on IBM's Personal Computer and others). Cost is \$750. ... Lifeboat Associates and Intel have cooperatively formed iRUG, a users group for Intel's iRMX-86 operating system. For information write iRUG, Lifeboat Associates, 1651 Third Ave., New York, NY 10028.... Intel is reportedly shipping its Ada compiler for the iAPX432 32-bit microprocessor and hopes to have its 432 development system available in the last guarter of this year.

"CP/M 2.2 is extremely important, and the Z80 chip will live forever because of it."
Dr. Portia Isaacson
Future Computing Inc.

**MAIL:** I receive a large number of letters each month as a result of this column. If you write to me and wish a response, please include a self-addressed, stamped envelope.

Sol Libes POB 1192 Mountainside, NJ 07092

# Model 953A EPROM PROGRAMMER



- Programs 2508, 2758, 2516, 2716, 2532 and 2732 five volt EPROMS.
- Complete no personality modules to buy.
- Intelligent microprocessor based, programs and verifies any or all bytes.
- RS-232 serial interface use with computer or terminal.
- Verify erasure command verifies that EPROM is erased.
- Extended diagnostics error output distinguishes between a bad EPROM and one which needs erasing.
- May be used for extremely reliable data or program storage.
- All power on programming socket under processor control, LED warning light indicates when power is applied.
- · Complete with Textool zero insertion force socket.
- High performance/cost ratio.
- Standard DB-25 I/O connector.

PRICE \$289



BAY TECHNICAL ASSOCIATES, inc.

HWY. 603, P.O. BOX 387 BAY ST. LOUIS, MISSISSIPPI 39520 (601) 467-8231



# **NEECO**

#### WHY BUY FROM THE BEST?

Service... Support... Software...



#### **Commodore**

16K B (16K RAM-40 Column) - Lim. Qty	\$ 995
32K B (32K RAM-40 Clm.) - Lim. Qty	\$1295
4016 (16K RAM 4.0 Basic-40 Clm.)	\$ 995
4032 (32K RAM 4.0 Basic-40 Clm.)	\$1295
8032 (32K RAM 4.0 Basic-80 Clm.)	\$1495
8050 Dual Disk (1 Meg. Storage)	\$1795
4040 Dual Disk (343K Storage)	1295
	280
C2N Cassette Drive	95
CBM - IEEE Interface Cable	40
IEEE - IEEE Interface Cable	50
VIC 20 Home/Personal Computer	295

#### CALL NEECO FOR ANY OF YOUR COMMODORE COMPUTER NEEDS

#### **EPSON PRINTERS**

MX-80 PRINTER										
MX-80 FT										
MX-100			 	 	 	 	 	٠.	 \$	945
MX-70			 	 	 	 	 		\$	459
INTERFACE CARDS										
8141 (RS-232)			 	 	 	 	 		\$	75
8150 (2K Buffered RS	5-232	2) .	 	 	 	 	 		\$	150
8161 (IEEE 488)			 	 	 	 	 	٠.	\$	55
8131 (Apple Card) .			 	 	 	 	 		\$	85
8230 (Apple Card) .			 	 	 	 	 		\$	25
8220 (TRS-80 Cable)										35

#### **NEC SPINWRITER PRINTERS**

1000 01 1101011111111111111111111111111	
5530 (Parallel)	\$3055
5510 (Serial)	\$3055
5520 (KSR-Serial)	\$3415
Tractor Option	\$ 225

#### **DIABLO 630 PRINTER**

DIABLO 630 - Se	erial	- R	S-2	23	2.									•0	 			\$27	/10	)
Tractor Option																				

			2	
100 ST	4	THE NE		-84
	D	pple		

PAR I bet
16K APPLE II+ \$1330
32K APPLE II+ \$1430
48K APPLE II+ \$1530
APPLE DISK w/3.3 DOS . \$ 650
APPLE DRIVE Only \$ 490
APPLE III 128K - In Stock!
w/Monitor +

Info Analystpak . . . . \$4740

ADDIE

#### **AMDEK MONITORS**

Video	100	12"	B+	W.		٠		'n.	\$	179
Video	300	12"	Gr	een					\$	249
Color	113"	Lo	W	Res					\$	449
Color	II 13	" H	igh	Res	5		٠		\$	999

#### INTERTEC COMPUTERS

6	64K Superbrain		
ì	(360 Disk Storage), CP/M™	\$3495	
1	64K QD Superbrain		4
	(700K Disk Storage), CP/M™	\$3995	

\*CP/M is a registered trademark of Digital Research





#### ATARI COMPUTERS

Atari 400 (16K RAM)	\$ 399
Atari 800 (32K RAM) - good thru 8/31	\$1080
Atari 410 RECORDER	\$ 89.95
Atari 810 DISK DRIVE	\$ 599.95

NEECO carries all available ATARI Software and Peripherals.

#### **PROFESSIONAL**

WordPro	1 8K				\$	29.95
		Clm.)16K				
WordPro	3+				\$	295
WordPro	4 (80	Clm.) 32k	ί.		\$	375
WordPro	4+				\$	450

JUST A SAMPLE OF THE MANY PRODUCTS WE CARRY, CALL US FOR OUR NEW 60-PAGE CATALOG. WE WILL MATCH SOME ADVERTISED PRICES ON CERTAIN PRODUCTS LISTED UNDER SIMILAR "IN STOCK" CONDITIONS.



#### NEECO

679 HIGHLAND AVE. NEEDHAM, MA 02194 (617) 449-1760 Telex: 951021

MON-FRI 9:00 - 5:00





MasterCharge and VISA Accepted

#### **Ask BYTE**

#### Conducted by Steve Ciarcia

#### **Cows and Catalogs**

Dear Steve,

Another gentleman and I are currently trying to adapt the Radio Shack TRS-80 Color Computer for farm-control applications. Initially, we plan to develop a system for computer-controlled feeding of dairy cows.

One of our biggest hurdles involves reliably identifying each cow (up to 250) as she approaches the feeder. We'd like the computer to decide how much feed she is to receive and to update each cow's statistics.

We need a unit that can be worn by the cow like a neck-lace and mated with control circuitry on the feeder. Obviously, durability and temperature sensitivity are major concerns. Do you have any ideas that might prove useful?

In a different vein, my library of device manufacturers' and distributors' catalogs is very small. Although it's not too difficult to get catalogs from distributors listed in magazines like BYTE, I know that there are many outfits that could prove more useful. I have the feeling that many distributors ignore the most versatile and useful components because of their limited appeal. Can you suggest a method of building a larger device and component library?

Gary L. Filkins Jr. Otsego, MI

I am not familiar with cows, but I assume that you are not looking for a totally automated feeding arrangement and that someone will be available at the feeder to do whatever is necessary.

For reliability, I would suggest that the device around

the cow's neck be a passive one, i.e., no batteries to replace. The first thing that comes to mind is a dog tag (cow tag?) with a bar code (similar to the Universal Product Code) printed on it. When a cow approaches the feeder, the tag is read with a light-sensitive wand and the computer prints out the feed requirements and other pertinent data. This would require an optical bar-code interface to your computer.

Another device would need a resistive element molded into the cow tag with two ends brought out to a connector or wiper. As a cow approached, she would "punch in" to a device that would incorporate the resistance in an oscillator circuit and output a frequency unique to each cow. The computer would identify each cow by the generated frequency. A unit must be constructed to use this con-

Here are a couple of approaches to beef up your device manufacturers' and distributors' catalog library. First, the major semiconductor manufacturers publish data catalogs and application notes about their products. You can contact their literature departments directly. Second, you might like to get the Electronics Engineers Master Catalog, which covers many manufacturers. It's available from United Technical Publications, Circulation Department, 645 Stewart Ave., Garden City, NY 11530. . . . Steve

#### **TV Jitter Bugs**

Dear Steve.

When I use my TRS-80 Color Computer with an old Motorola tube-type color TV set, the picture is great. When I use it with my new 12-inch Sanyo, lots of evenly spaced horizontal bars fade in and out at about 1 Hz. Sometimes they disappear, at other times they appear diagonally or vertically. The controls have no effect, and similar bars appear much more dimly on a set in the Radio Shack store. On a 12-inch black-and-white portable TV, the bars are worse still and, in addition, the picture will sometimes bend as a "bump" rises slowly up the screen.

Is there something wrong with my set, or do all radio-frequency (RF) modulators do this? Can I just tap the signal going into the Astec RF modulator and pipe it directly into the video section of the set? I wrote Tandy Corporation and was referred to the manufacturer of my television. But why would it care whether my Color Computer works?

Charles Hall Raleigh, NC

Your problem is not caused by the RF modulator, but by a slight "sync" incompatibility between the computer and the TV. Many of the newer TVs use phase-locked synchronization circuitry and their capture range is not great enough for some computers.

It's interesting to note that an article in the January 1981 Consumer Reports, "19-inch color TV's" (see page 36), dealt with this phenomenon. Consumers Union tested a number of televisions with an Apple II computer. It found that two models (Zenith and Sylvania) had a "severe vertical jitter, making the display almost unreadable."

While this is little consola-

tion to you, in your case it may not be your TV. You mentioned the same effect occurred with your computer on a television in a store. Did the store's Color Computer exhibit these bars? If not, you may have a defect in your computer.

In summary, the problem exists with some television sets. Run a swap test with a Color Computer that functions normally and determine where the fault lies. . . . Steve

#### Downloading to CP/M

Dear Steve.

A brochure on Visicorp's Visiterm software package claims that it will allow information to be downloaded from a larger host computer to an Apple II. Do you know of any similar software packages that will allow downloading to a CP/M-based microcomputer? My company has a Z80-based computer with a Soroc IQ-120 terminal and CP/M 2.2. The host computer is an IBM 360/370.

John E. O'Hare Tucson, AZ

Lifeboat Associates (1651 Third Ave., New York, NY 10028, (212) 860-0300) sells a utility program, called BSTMS, which allows you to download certain software from a large mainframe computer. BSTMS is available for many CP/M configurations at a cost of \$400.

A popular public-domain telecommunications program is Modem73, which is the latest version of a program written by Ward Christensen. Modem73 is available at a low cost from the CP/M User's Group, which can be

Wild Hare Software Systems Multiply the Capabilities of Data General's

# RDOS INFOS® ICOS DOS

Wild Hare gives Data General users a choice when upgrading to a multi-user environment and eliminates the need to use AOS.
Wild Hare makes it easy for you. It creates a true multi-lingual, multi-user environment for your current system. No user software modifications are necessary. There is no need to install a new operating system. And, no expensive hardware upgrade is required.

#### **Features**

- · Each user is totally independent of all other users.
- · Each user may run all standard Data General software.
- Each user may independently edit, compile, execute and debug programs written in any language supported by RDOS, INFOS®, ICOS and DOS.
- Standard languages supported include: Fortran IV, Fortran V, COBOL, ALGOL, RPG, DG/L™, BASIC, PASCAL, MAC, etc.
- · All NOVA's® and ECLIPSE's® are supported.
- · Wild Hare guarantees its software systems on a money back basis.

Wild Hare's Software Gives Data General Users A Choice!

NOVA\*, ECLIPSE\* and INFOS\* are registered trademarks of Data General Corporation (2)

contacted via Lifeboat Associates. Winterhalter & Associates Inc. (313 North First St., Ann Arbor, MI 48103. (313) 662-2002) has a number of programs, known as the Micro 3270 family, that emulate an IBM 3270 interactive terminal and the IBM 3780, 2780, 3741, and 2770 remote-job entry terminals. Some of the versions run under CP/M.

Hope this is of some help. . . . Steve

#### **Digital Speedometer**

Dear Steve.

I want to build a digital speedometer with a threedigit readout having increments of 5 miles per hour (mph) or even 1 mph. Input pulses can be taken on a onepulse-to-one-tire-revolution basis directly from the axle or brake drum. My tires have a diameter of about 291/2 inches.

I also want to build a digital tachometer with a three-digit readout to display my four-cylinder engine's speed at any range up to 9990 revolutions per minute (rpm). Input pulses can be taken from an engine pulley or from the ignition coil.

I haven't had any luck in locating circuit diagrams for these units. Can you help? Peter I. Pinette Yorktown Heights, NY

A circuit for a digital speedometer can be found in the January 1981 "Ask BYTE" (see page 288). The article has enough information to configure one for your purpose. A digital tachometer can be made using the same concepts.

My Circuit Cellar article "DC Motor Controls: Build a Motorized Platform" (May 1981 BYTE, page 66) also contained information on this subject.

Both circuits consist of signal conditioners feeding decade counters with the binary-coded decimal (BCD) outputs converted to drive seven-segment light-emitting diode (LED) displays. If you understand how the various counters work (refer to manufacturer's data sheets), you can tailor the circuits to your specific applications. . . . Steve

# Collector Edition

The Byte covers shown below are available as beautiful Collector Edition Prints. Each full color print is 11" × 14", including 11/2" border, and is part of an edition strictly limited to 500 prints. The artist, Robert Tinney, has personally inspected, signed and numbered each print. A Certificate of Authenticity accompanies

each print guaranteeing its quality and limited number.
The price of a Collector Edition Byte Cover is \$25, plus \$3 per shipment for postage and handling (\$8 for overseas airmail).

Collector Prints 9, 10, 11 and 12 can be purchased as a set for \$80, as can Prints 13, 14, 15 and 16.

Collector Edition Byte Covers are also available in the beauti-

ful mat and frame shown above for \$60 each (if Set 9-12 or Set 13-16 is ordered framed and matted, the price per set is \$200). The mat is a neutral gray which blends with most decors, and the

black 12" x 16" frame is trimmed in silver. The print is mounted under non-glare glass.

Framed and matted prints are shipped UPS-no delivery to P.O. boxes. Because of expense and breakage, no framed prints are shipped overseas. Please allow 4-6 weeks delivery for framed prints.

To order use the coupon below; Visa and Master Charge orders may call Toll Free.



THE PROGRAMMING ROUTE













13-16,

Set 9-12,



#### Data In, Garbage Out

Dear Steve.

Most people using small computers for hobby or business have experienced garbled data at some time. In my own case, it happens occasionally on data files on my Charles River Data HD11-T, which is hooked to a Heath H-11A (based on the LSI 11/23 microprocessor). The files have been known to be correct beforehand. Unfortunately, there is no indication that something has garbled the file until it is accessed.

I suspect that some sort of power glitch affecting the disk drive is the culprit, but there hasn't been lightning or any indication of power problems while the system Interested in computers or robotics? Looking for info on hardware, software, theory, and applications?

The Computer BOON CHO offers you an incredible range of computer books and a huge variety of tapes and disks . . . ALL at low, low member prices!

List \$18.95

**80 PRACTICAL** TIME-SAVING PROGRAMS

FOR THE TRS-80

1293

List \$15.95

1053

List \$13.95

Microprocessor Cookbook

### Select 6 fact-filled books for only \$295 (total value up to \$106.70)

List \$12.95

PROGRAMMING

APPLEII

COMPUTER

HOW TO DESIGN, BUILD R. PROCHAM BUILD GWA RORNA BUILD BYSTER BUILD BUILD

Programmer's

Guide to LISP

1045

List \$11.95

MASTER HANDBOOK OF MICROPROCESSOR CHIPS

1299

List \$16.95

1111

List \$15.95

1276

List \$15.95

DIPLITER

PROJECTS
IN MACHINE INTELLIGENCE
FOR YOUR
HOME
COMPUTER

GRAPHICS with 29 ready-to-run progresses approximate

1394 List \$15.95





List \$13.95 1160 1055 List \$12.95 List \$8.95 1333 List \$16.95 BASIC

101 MICROPROCESSOR SOFTWARE & HARDWARE PROJECTS PLAYING THE STOCK & BOND MARKETS WITH YOUR PERSONAL COMPUTER

30 COMPUTER PROGRAMS FOR THE HOMEOWNER

1380

List \$18.95

BY-582

N BASIC

Cookbook

A subject dictions of or hard appendix comments of fact backway — all proposeing ages for del for your

Join now and get The "Compulator" Book . . . FREE! (List \$7.95)

1330

List \$15.95

#### 7 very good reasons to try The Computer Book Club Blue Ridge Summit, PA 17214

· Reduced Member Prices. Save up to 75% on books sure to increase your know-how

· Satisfaction Guaranteed. All books returnable within 10 days without obligation

· Club News Bulletins. All about current selections-mains, alternates, extras—plus bonus offers. Comes 10 times a year with dozens of up-to-the-minute titles you can pick from

· "Automatic Order". Do nothing, and the Main selection will be shipped automatically! But . . . if you want an Alternate-or no books at all-we'll follow the instructions you give on the reply form provided with every News

· Continuing Benefits. Get a Dividend Certificate with every book purchased after fulfilling membership obligation, and qualify for discounts on many other volumes

Extra Bonuses. Take advantage of added-value promotions, plus special discounts of software, games, and more Exceptional Quality. All books are first-rate publisher's editions, filled with up-to-the-minute info



1398

List \$14.95

MASTER

1199

List \$16.95

1000

List \$10.95

Digital

57 PRACTICAL PROGRAMS & SAMES IN BASIC

Interfacing With An Analog World

1070

List \$14.95

#### THE COMPUTER BOOK CLUB Blue Ridge Summit, PA 17214

1251

List \$16.95

Please accept my membership in the Computer Book Club and send the 6 volumes circled below, plus a free copy of The "Compulator" Book. I understand the cost of the books selected is \$2.95 (plus shipping/handling). If not satisfied, I may return the books within ten days without obligation and have my membership cancelled. I agree to purchase 4 or more books at reduced Club prices during the next 12 months, and may resign any time thereafter.

1000 1045 1053 1055 1062 1070 1088 1111 1160 1169 1187 1199 1200 1205 1228 1251 1275 1276 1293 1295 1299 1330 1333 1341 1380 1391 1394 1398

Name	Phone
Address	
City	
State	Zip
(Valid for new members only. Fore	ign and Canada add 20%. Orders outside

1295

List \$16.95

55 Advanced amputer Programs

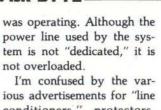
1205

List \$15.95

GIANT

List \$15.95

#### Ask BYTE-



conditioners," protectors, and regulators. How do you know if you really need one of these things, barring frequent catastrophes, and how do you choose the one suited for your installation? A 1-kilovolt-ampere (kVA) capacity regulator costs about \$500, so it would be nice to know it would help before making the purchase. It would even be better to save part of the cost by building it!

Iames R. Monnahan Provo, UT

Basically, two types of power-line problems affect computers: voltage transients and voltage fluctuations. Transients tend to place spikes (i.e., short-duration. high-voltage pulses) on the power-supply line. Spikes can raise havoc with a computer. Fortunately, a welldesigned and regulated power supply can suppress many of them. Poorly designed power supplies generally fail under a severe transient, usually by means of shorted diodes.

Ordinarily, voltage fluctuations are visible in the form of lights dimming or flashing. The problem here is that if the voltage goes too low, the regulators in the power supply cannot compensate and the voltage in the computer drops below the minimum specifications. The result is garbled data.

On the other end, high line voltages should be taken care of by power-supply regulator circuits. Because a computer's power transformers are usually step-down devices, higher voltages result in an increase in heat dissipation by the regulators.

Line conditioners and protectors are often metal-oxide varistors (MOVs) or zener diodes designed to clip transients above a certain level. which protects circuits downstream. The regulators are designed to maintain the line voltage between prescribed

Which device is required for your computer? I would try to be more aware of the lights dimming or flashing (e.g., when a large motor starts or stops). If this is the case, either add a regulator or eliminate the offending device. Otherwise, try a clipping device. . . Steve

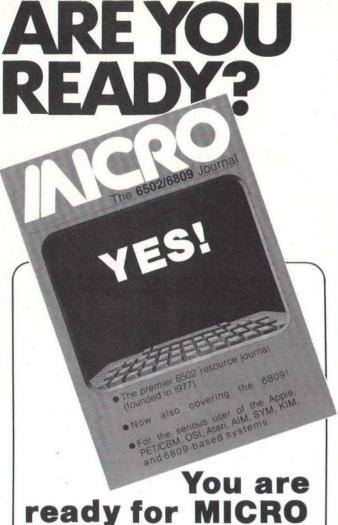
#### Wanted: RS-232C-to-IEEE-488 Interface

Dear Steve.

I recently assumed a new position at Kenyon College and discovered that some of the scientists on campus have become very frustrated trying to use a Hewlett-Packard HP-9872A Plotter that is attached to an HP-2647 Graphic Terminal. They have managed to learn about handshaking sequences and other protocols, but the problem seems to be the interface. A salesman informed me that the plotter interface is an IEEE-488 and not the RS-232C type that is standard on an Digital Equipment Corporation PDP-11/70.

Two solutions are obvious: to replace the plotter with a different model that has the appropriate interface, or to buy or build a "black box" that does bidirectional RS-232C-to-IEEE-488 conversion. Since I'm not truly informed about electronics, I am wondering about the difficulty of making such a black box and about the cost of obtaining one, if I could even locate such a device.

Perhaps you know of someone or some company that has made such a device-or could you give me some estimates on the relative



ready for MICRO if you want to. . .

- □ Go beyond canned software
- ☐ Use your computer for more than games
- ☐ Learn advanced programming techniques
- □ Understand the inner workings of your computer
- □ Get the most out of your 6502/6809 system

Month after month, MICRO gives readers sophisticated software applications, detailed discussions of programming languages, and indepth hardware tutorials.

To get the most out of your machine, say YES to MICRO today! We accept VISA or Mastercard. \$24.00 per year in the U.S., **\$27.00** elsewhere.

Use Our 24-hour Toll-free Service 800-227-1617<sub>Ext.546</sub>

In California: 800-772-3545, Ext.546



34 Chelmsford Street P.O.Box 6502 Chelmsford, MA 01824

# Take your pick of the litter.

When you're ready to let your computer out and introduce it to the rest of the world, one of the Cat family of Modems is the way to do it.

Take your pick. You can't go wrong. They're all purebreds—from Novation, the recognized world leader in personal communications.



#### **Cat Acoustic Modem**

Fast, accurate, reliable originate/answer modem—with built-in diagnostics. Just add your computer and phone. Then dial up the world. \$189\*\*

## **Super Mike**

Replace your phone's carbon mike with Super Mike. No more carbon granule problems. Making things perfectly clear has never been so easy.

\$14.95\*\*





#### **Auto-Cat**

Answers automatically and stores data in your computer until you're ready. The world's first LSI 103 modem. State-of-the-art, all digital, crystal controlled direct connect.

You're off the hook for under \$250\*\*



Major breakthrough—the intelligent modem. Slips into your Apple. All auto functions, selectable baud rates, Serial RS-232 port, BSR X-10 controller\*\*\* easy-to-use self-prompting format. Other options available.

From \$389\*\* including software



#### **D-Cat**

Get the performance and reliability of a direct connect modem (up to 20dB improvement) with the portability and price of an acoustic. Use it at home. Use it at work. Truly unique. So's the price. \$199\*\*



Call for details: (800) 423-5410

In California (213) 996-5060

Available from Avnet Electronics, Hamilton Electro, Hamilton Avnet, Kierulff Electronics, Byte Shops, Computerland, and your local computer store.

Novation, Inc., 18664 Oxnard Street, Tarzana, California 91356

\*Apple is a registered trademark of Apple Computer Inc. Cat is a trademark of Novation, Inc. which does not make Apple computers.

\*\*Suggested retail price \*\*\*BSR is a trademark of BSR Corporation

Circle 307 on inquiry card.

BYTE May 1982 40

# STARTING YOUR OWN MICROCOMPUTER BUSINESS

Starting your own microcomputer business is easy if you know the right steps to take. Two volumes of the new book **Your Fortune In The Microcomputer Business** describe the things you should know to start right and to build your business successfully.

Many people have good ideas for a successful microcomputer business. But they don't know how to put their ideas into action. These people are plenty smart. That's not the problem. The problem is in knowing simple things: How to analyze the market. How to select the right product or service. How to get enough startup money. How to plan your growth and success. The answers to these problems are not hard to understand. All you need is the right information. Your Fortune In The Microcomputer Business gives you the knowledge tools to start right, grow and prosper.

This practical reference manual has no hocus-pocus. It does not tell you how to do astrology or dating services. It does give you clear, complete, step-by-step instructions on how to get started right and insure your success!

#### **Volume I Includes:**

- The hottest trends in the market
- The seven best test markets
- How to read between the lines at a trade show
- 107 ways to reach your market
- Examples of the best ads in the business
- How to get free advertising
- The 21 steps to set up your business
- How to start a manufacturing business
- How to write a newsletter
- How to give a seminar
- How to start a service business
- How to package software for the mass market
- How to be a highly paid consultant
- Franchising-the good, the bad and the ugly
- Interviews with six successful microcomputer businesses
- How to use the RLC factor to be street smart, lean, mean and successful

#### Volume II Includes:

- Strategies for growth
- Straight facts on incorporation
- How to build your organization
- How to manage cash flow
- How to develop your accounting system
- How to manage employees, wages and salaries
- How to survive a cash crunch
- What to do if things get really bad
- How to maximize your profits
- How to grow by acquisition
- How to value your business
- How and when to sell your business

#### WRITE OR CALL—DON'T WAIT!

#### Wildfire Publishing, P.O. Box 420-DS Carpinteria, CA 93013 Ph. (805) 684-1489

Please send the following book(s) by return mail. I understand if I want to return them for any reason within 30 days of receipt, I can do so and get a prompt full refund.

- ☐ Your Fortune In The Microcomputer Business Vol. I, Getting Started, \$20.00. (Postpaid)
- ☐ Your Fortune In The Microcomputer Business Vol. II, Growth, Survival and Success, \$20.00. (Postpaid)

	th, Survival and Success,	
Calif. residents ple	ease add \$1.20 each sales to	ax.
Name		
Street		
City	State	_ Zip
Enclosed is	or charge my Maste	rCharge 🗆 or Visa 🗆
Card #		
	MCInterbank #	

#### Ask BYTE-

ease or difficulty of building one?

Robert A. Rennert Kenyon College Gambier, OH

Any easy solution is always expensive (Murphy's Law) and the cheap solution very hard (again, Murphy's Law). However, don't give up hope.

Your first idea, replace the plotter, is a good one. The Hewlett-Packard 7221A Plotter is the RS-232C equivalent of the 9872A Plotter and it costs about the same. Your second solution is also good. One type of black box on the market is the GPIB (general-purpose interface bus, equivalent to the Hewlett-Packard interface) controller with RS-232C interface. Another is the PDP-11-to-GPIB interface card of which the National Instruments series is a good example.

Finally, building you own interface is less expensive but more difficult than buying one ready-made.

Here are some sources for literature and hardware. . . . Steve

Fairchild Camera and Instrument Corporation 464 Ellis St. Mountain View, CA 94042 (Re: 96LS488 GPIB circuit) Hewlett-Packard Company 9920 Carver Rd. Cincinnati, OH 45242 (Re: Publications 5952-0058 and 5952-0156)

#### RS-232C-to-GPIB interface

Physical Data Inc. 8089 Southwest Cirrus Dr. Beaverton, OR 97005

ICS Electronics Corporation 1620 Zanker Rd. San Jose, CA 95112

#### Unibus-to-GPIB interface

National Instruments Building A-117 8900 Shoal Creek Austin, TX 78758.■

In "Ask BYTE," Steve Ciarcia answers questions on any area of microcomputing. The most representative questions received each month will be answered and published. Do you have a nagging problem? Send your inquiry to:

Ask BYTE clo Steve Ciarcia POB 582

Glastonbury CT 06033
If you are a subscriber to
The Source, send your questions by electronic mail or
chat with Steve (TCE317)
directly. Due to the high
volume of inquiries, personal replies cannot be
given. Be sure to include
"Ask BYTE" in the address.

#### And then there were none.

The list of already extinct animals grows . . . the great auk, the Texas gray wolf, the Badlands bighorn, the sea mink, the passenger pigeon . . .

What happens if civilization continues to slowly choke out wildlife species by species?

Man cannot live on a planet unfit for animals.

Join an organization that's **doing** something about preserving our endangered species. Get involved. Write the National Wildlife Federation,

Department 105, 1412 16th Street, NW. Washington, DC 20036. It's not too late.



Volume I

Volume II

Growth, Survival

and Success

be VICTOR WILD

**Getting Started** 

to victor with



# AIM 65. The professional's microcomputer.

Printer, display, full keyboard. Only \$465.00.

For professional learning, designing and work, Rockwell's AIM 65™ microcomputer gives you an easy, inexpensive head start.

- ☐ 20-column printer and display
- ☐ Dual cassette, TTY and general purpose I/0
- ☐ R6502 NMOS microprocessor
- ☐ System expansion bus
- ☐ Read/write RAM memory

- ☐ PROM/ROM expansion sockets
- Self-prompt interactive monitor firmware
- ☐ Terminal-style keyboard
- ☐ Options available include:
  - —PROM programmer module
  - —RM 65 standard modules and card cages
  - power supply and enclosure

For more on the AIM 65 micro-computer and how you can develop programs in assembly language, BASIC, PL/65, Pascal or FORTH\*, write Rockwell International, Electronic Devices Division, RC55, P.O. Box 3669, Anaheim, CA 92803. For location of nearest distributor or dealer call 800-854-8099 (in California 800-422-4230).



# Birth of a legend.



# Epson.

A whole new generation of Epson MX printers has just arrived. And while they share the family traits that made Epson famous — like unequalled reliability and ultra-fine printing — they've got a lot more of what it takes to be a legend.

For instance, they've got a few extra type styles. Sixty-six, to be exact, including italics, a handy subscript and superscript for scientific notation, and enough international symbols to print most Western languages.

What's more, on the new-generation MX-80, MX-80 F/T and MX-100, you get GRAFTRAX-Plus dot addressable graphics. Standard. So now you can have precision to rival plotters in a reliable Epson printer. Not to mention true back-space, software printer reset, and programmable form length, horizontal tab and right margin.

All in all, they've got the features that make them destined for stardom. But the best part is that beneath this software bonanza beats the

# Uh...three legends.

heart of an Epson. So you still get a bidirectional, logical seeking, disposable print head, crisp, clean, correspondence quality printing, and the kind of reliability that has made Epson the best-selling printers in the world.

All of which should come as no surprise, especially when you look at the family tree. After all, Epson *invented* digital printers almost seventeen years ago for the 1964 Tokyo Olympics. We were

the first to make printers as reliable as the family stereo. And we introduced the computer world to correspondence quality printing and disposable print heads. And now we've given birth to the finest printers for small computers on the market.

What's next? Wait and see. We're already expecting.

**EPSON**EPSON AMERICA, INC.

3415 Kashiwa Street • Torrance, CA 90505 • (213) 539-9140

FEATURE	ORIGINAL MX-80	GRAFTRAX-80*	ORIGINAL MX-100	MX-80 wit	MX-10 -Plus	
Bidirectional printing	X	Х	Х	Х	х	х
Logical seeking function	X	X	X	X	X	X
Disposable print head	X	х	Х	Х	X	X
Speed: 80 CPS	X	X	X	X	X	X
Matrix: 9 x 9	X	X	Х	X	X	X
Selectable paper feed			Х		X	X
PAPER HANDLING FUNCTIONS						
Line spacing to n/216		X		Х	X	Х
Programmable form length	X	X	Х	X	X	X
Programmable horizontal tabs	X	X	X	X	X	Х
Skip over perforation			X	X	X	Х
PRINT MODES AND CHARACTER FONTS						
96 ASCII characters	х	Х	Х	Х	X	Х
Italics character font		X		Х	X	х
Special international symbols				Х	X	Х
Normal, Emphasized, Double-Strike and Double/Emphasized print modes	х	х	х	х	х	х
Subscript/Superscript print mode			100	Х	X	Х
Underline mode				X	Х	X
10 CPI	x	X	Х	X	x	Х
5 CPI	X	X	Х	X	X	Х
17.16 CPI	X	X	X	X	X	Х
8.58 CPI	X	X	Х	X	х	Х
DOT GRAPHICS MODE						
Line drawing graphics				Х	X	Х
Bit image 60 D.P.I.		X	X	X	X	X
Bit image 120 D.P.I.		X	X	X	X	Х
CONTROL FUNCTIONS						
Software printer reset	13.	Х		X	Х	Х
Adjustable right margin			X	X	X	Х
True back space		X		X	X	Х
INTERFACES						
Standard — Centronics-style 8-bit parallel	Х	Х	Х	X	X	Х
Optional — RS-232C current loop w/2K buffer	X	Х	Х	х	X	Х
RS-232C x-on/x-off w/2K buffer	х	х	Х	х	X	Х
IEEE-488	х	X	X	Х	X	Х

<sup>\*</sup>Tandy TRS-80 block graphics only available with GRAFTRAX 80.

ABCDEFGHIJKLMN abcdefghijklmn ABCDEFGHIJKLMN abcdefghijklmn Ø1234
ABCDEFGHIJKLMN abcdefghijklmn ABCDEFGHIJKLMN abcdefghijklmn Ø1234
ABCDEFGHIJKLMN abcdefghijklmn ABCDEFGHIJKLMN abcdefghijklmn Ø1234
ABCDEF abcdef ABCDEFabcdef Ø123456
ABCDEFGHIJKLMN OPGRSTUVNX abcdefghijklmn opgrstuvn ABCDEFGHIJKLMN OPGRSTUVNX abcdefghijklmn opgrstuvn Ø1234567
ABCDEF abcdef ABCDEFabcdef Ø1234567

ABCDEFGHIJKLMN あちには参fghijklmnopqrstuvwx*BBCDEFGHIJKLMNOPQRSTUVNXebcdefghijklmnopqrstuvwx B*1234567 ABCDEFGHIJKLMNOPQRSTUVWX abcdefghijklmnopqrstuvwx*BBCDEFGHIJKLMNOPQRSTUVNXebcdefghijklmnopqrstuvwx B*1234567 Circle 165 on inquiry card.

#### **Event Queue**

#### May 1982

May

Courses from Boeing Computer Services, various sites throughout the U.S. Boeing Computer Services is offering a wide variety of computerrelated courses at its regional service centers. Course topics range from "Introduction to Data Processing" to "Structured Program Development in FORTRAN." For a complete schedule of times, locations, and fees, contact Boeing Computer Services Co., Education and Training Division, POB 24346, Seattle, WA 98124, (206) 575-7700.

May

Courses in Structured Systems, various sites throughout the U.S. Courses in "Structured Systems Design," and "Structured Requirements Definition" are being offered by Ken Orr and Associates. For information on meeting times, places, and fees, contact Ken Orr and Associates Inc., 715 East 8th, Topeka, KS 66607, (800) 255-2459; in Kansas, (913) 233-2349.

May

Courses from George Washington University, San Jose, CA; Washington, DC; Mexico City; Mexico; and Berlin, West Germany. Among the courses scheduled are "Computer Performance Evaluation," "Workshop in Data Communications for Microcomputers," and "Microcomputer Applications Workshop." Fees range from \$590 to \$760. Contact Continuing Engineering Education, School of Engineering and Applied Science, George Washington University, Washington, DC 20052, (800) 424-9773; in the District of Columbia, (202) 676-6106.

May

Seminars and Conferences from Datapro Research, various sites throughout the U.S. Among the topics to be presented are "IBM's Systems Network Architecture." "Data Dictionary/Directory Systems," and "Data Processing: Fundamental Concepts." Enrollment fees are \$640 for Datapro subscribers and \$690 for nonsubscribers. For a complete catalog with descriptions, dates, and locations, contact Datapro Research Corp., 1805 Underwood Blvd., Delran, NJ 08075, (800) 257-9406; in New Jersey, (609) 764-0100.

May

Technology Transfer Institute Seminars, Washington, DC, and San Francisco, CA. "Fundamentals of Database Management," "Fundamentals of Data Structures," and "X.25 and Other Protocol Interfaces" are among the seminars being offered. Contact Technology Transfer Institute, 741 10th St., Santa Monica, CA 90402, (213) 394-8305.

May-June

Intensive Two-day Seminars for Professional Development, various sites throughout New England. Among the seminars to be offered by Worcester Polytechnic Institute are "Fundamentals of Data Processing," "Distributed Systems: The Architecture and Utilization of this Revolutionary Technology," and 'Microprocessors: Hardware, Software, and Applications." Registration fees range from \$445 for a twoday program to \$990 for a seven-day executive institute. For complete details, contact Ms. Ginny Bazarian, Office of Continuing Education, Worcester Polytechnic Institute, Worcester, MA 01609, (617) 793-5517.

May-June

Cooperative Education Program, various sites throughout the U.S. This series of more than 100 data-processing courses is presented by O.E.D. Information Sciences Inc. Course topics include systems development, structured methodologies, database, telecommunications, management, and human relations. These two- to five-day courses are tailored for analysts, designers, programmers, managers, and other users. For additional details, contact the Manager of Education Programs, O.E.D Information Sciences Inc., O.E.D. Plaza, POB 181, Wellesley, MA 02181, (800) 343-4848; in Massachusetts, (617) 237-5656.

May-June

Courses and Seminars from Sira Institute, various sites throughout England. Sira Institute is sponsoring seminars on a wide variety of subjects, ranging from microprocessor familiarization to design and development of microprocessor-based equipment. For details, contact Conferences & Courses Unit, Sira Institute Ltd., South Hill, Chislehurst, Kent BR7 5EH, England.

May-June

National Computer Graphics Association Seminar Program, various sites throughout the U.S. Topics include "Computer Graphics: Technology and Applications," "Successful Business Graphics," and "Applications of Computer Graphics to Transportation Problems." Seminar fees are \$395 for association members and \$425 for nonmembers. For complete details, contact Eloise Wenker, NCGA Seminar, 2033 M St. NW, #300, Washington, DC 20036, (202) 466-4102.

May-June

Datamation Institute Seminars on Information Management, various sites throughout the U.S. Databases and communications, systems performance, data-processing management, word processing, office automation, computer graphics, and topics of general interest are among the areas to be covered by these two-day seminars. Fees range from \$495 to \$595. For schedules of times and places, contact Karen Smolens, the Center for Management Research. Datamation Institute Seminar Coordination Office, 850 Boylston St., Chestnut Hill, MA 02167, (617) 738-5020.

May-June

Education and Training Seminars, various sites throughout the U.S. and Europe. Among the seminar topics offered by STSC Inc. and APL\*Plus International are "Nested Arrays," "Intermediate APL," and "Advanced APL Programming Techniques." For complete details on these and other seminars, contact the Seminar Administrator, STSC Inc., 11 Clearbrook Rd., Elmsford, NY 10523, (914) 347-5560. In Europe, contact APL\*Plus International, Tour Neptune, Cedex N°20, 92086 Paris La Défense, France, Tel: 773.79.64.

May-June

The Master Method of Selling Small-Business Systems, Westlake Village, CA. This one-day seminar is designed for mini- and microcomputer manufacturers and software vendors who sell small-business systems. The seminar fee is \$150. For details, contact Seminar Information, M. W. L. Inc., 32038 Watergate Court, Westlake Village, CA 91361, (213) 889-2607.

SI2KB WRS232 PORT

YOU CAN'T KEEP A
GOOD MEMORY
DOWN

EXCEPT IN PRICE AND AT CHRISLIN WE PROVE IT!

Our CI-S100 64KB single card is compatible with most S100 bus systems.

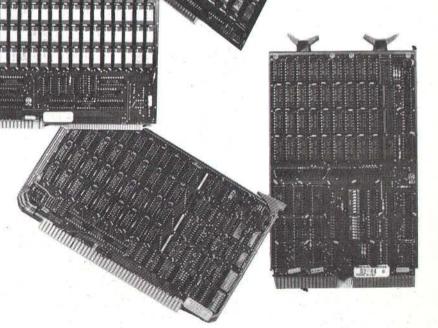
The CI-6800/2 expansion memory for EXORCISOR I and EXORCISOR II microprocessors has a capacity of 64KB on a single card, parity is standard.

We offer new super competitive memory prices for your LSI 11, Motorola, IBM PC, S100, and Multibus microprocessor based systems.

Our new add-in expansion memory for IBM's Personal Computer has capacity up to 512KB on a single card with one RS232-C port and parity.

The CI-1123 add-in memory has capacity up to 256KB on a single board, parity is standard.

The CI-8086 is compatible with the Multibus 8 bit and 16 bit microprocessors. The memory has capacity up to 512KB on a single card, and parity is standard.



DON'T ASK WHY WE CHARGE SO LITTLE, ASK WHY THEY CHARGE SO MUCH.



Chrislin Industries, Inc.

31352 Via Colinas • Westlake Village, CA 91362 • 213-991-2254 TWX 910-494-1253 (CHRISLIN WKVG) May-June

One- and Two-day Professional Development Seminars, various sites in the greater Boston area. Among the courses being offered by Boston University are "Business Writing for Results," Improving Customer Service," and "Assertive Management." Registration fees range from \$295 for a oneday program to \$445 for a two-day program. These seminars can be conducted within your company. For details, contact Ms. Joan Merrick, Center for Management Research, 850 Boylston St., Chestnut Hill, MA 02167, (617) 738-5020. For information on the in-company seminars, contact Ms. Elaine Dee at the same address.

May-lune

Productivity '82, various sites throughout the U.S. and Canada. This two-day show features hands-on demonstrations of Hewlett-Packard's newest computer and application solutions ranging from personal and smallbusiness computers to the top-of-the-line computer systems for office computing, distributed data processing. and factory automation. Sixteen different seminars are held each day on such topics as using personal computers, choosing financial and applications software, and preparing easy-to-read graphics. Additional information can be obtained from local Hewlett-Packard sales offices or from Rudanne Clark. Hewlett-Packard. 3000 Hanover St., Palo Alto, CA 94304, (415) 857-7247.

May-lune

Sensors & Systems '82, various sites throughout the central and western regions of the U.S. This series of three-day conferences will cover all aspects of sensor technology from temperature sensors through to displacement, velocity, acceleration, magnetic field, and moisture. Other topics to be covered include signal conditioning, digital interfaces, and system interfaces. Contact Network Exhibitions, 785 Harriet Ave., Campbell, CA 95008, (408) 370-1661.

May-July

Computerized Robots, various sites throughout the U.S. This four-day course is tailored for managers concerned with the planning and design of advanced manufacturing methods and for those who will be involved with the development and integration of high-technology robot systems. Course topics include the extent of robot automation in the U.S.. Japan, and Europe; technical capabilities and limitations of robots: robot sensory mechanisms, vision, touch, proximity; and programming techniques for robot control. The course fee is \$845. For details, contact Ruth Dordick. Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405, (800) 421-8166; in California, (800) 352-8251.

May-July

Meetings, Seminars, and Programs from the Electronic Industries Association (EIA). various sites throughout the U.S. Among the events planned are the Electronic Components Conference, the Government/Industry Executive Roundtable '82, and a symposium on "Telecommunications: Trends and Directions." Contact EIA, 2001 Eye St. NW, Washington, DC 20006, (202) 457-4981.

PACKARD

PERFORMANCE 7470

M HEWLETT

7470 PRODUCTIVITY

7470

# LOST PLOTTER

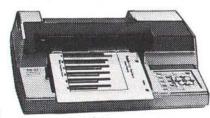
mfr. sugg. list \$1550

With a choice of Interfaces to work with

#### COMMODORE **HEWLETT PACKARD**

#### PERSONAL COMPLITERS

- Inexpensive to own
- Easy to operate
- Charts in minutes
- Superior resolution
- 2-pen auto plotting
- May use up to 10 COLORS
- For paper presentations
- For transparency presentations



Quality graphics made affordable by Hewlett Packard and Elek - Tek. The revolutionary new HP - 7470 personal computer plotter helps you chart such diverse data as statistical analysis, sales - profitdebt, engineering analysis, production and machine efficiencies, reports and forecasts, Return on equity and capital, project schedules, Working capital and cash flow, "what if" planning, market shares and more and more and MORE.

OF COURSE, it's PACKARD quality, reliability, service, support and SOFTWARE AVAILABLE so you don't need to program.

CALL TOLL-FREE 800-621-1269 (except Illinois, Alaska, Hawaii)

Accessories discounted too. Corporate Accounts Invited. Mastercharge or Visa by mail or phone. Mail Cashier's Check, Money Order, Personal Check (2 wks to clear). Add \$4.00 1st item; (Alaska, Hawaii, Puerto Rico, Canada add \$8.00 first item) \$1.00 ea. add'l shpg. & handl. Shipments to IL address add 6% tax. Prices subject to change.WRITE for free catalog. ALL ELEK-TEK MERCHANDISE IS BRAND NEW, FIRST QUALITY AND COMPLETE.



6557 North Lincoln Avenue, Chicago IL 60645 (800) 621 - 1269 (312) 677 - 7660

# The Hard & Soft of It: Atari from ASAF If you're into Atari, get into ASAP. When it comes to Atari, ASAP has it all — computers,

a full line of accessories, and one of the most complete lines of software on the market. Whether you use your Atari for work or play, make ASAP your source. Call

The Atari® 800™ Computer features color graphics and English characters with truly high resolution, high quality sound, expandable memory and sleek modular appearance.

Atari® 400™ — 16K also available: \$349.00.

OPTIONAL ACCESSORIES PRICE
ATARI® 410™ Program Recorder 80.00
ATARI® 810™ Disk Drive 455.00
ATARI® 822™ Thermal Printer 299.00
ATARI® 820™ 40-column Dot
Matrix Impact Printer 279.00
ATARI® 825™ 80-column Dot
Matrix Impact Printer 625.00
ATARI® 830™ Acoustic Modem 159.00
ATARI® 850™ Interface Module 169.00
ATARI® Paddle (CX30-04) and
Joystick (CX40-04) 17.95
ASAP 16K RAM Module 55.00

#### COMPLETE SOFTWARE LIBRARY INCLUDES THESE POPULAR UNITS:

#### **Atari®**

Video Easel ROM 25.00
Music Composer ROM 42.00
Assembler/Editor ROM 45.00
Mortgage Loan Analysis
Tape
Stock Analysis Disk 19.99
Stock Charting22.99
Bond Analysis Disk 19.99
Mailing List Tape 19.9
Touch Typing (2 tapes) 19.9
Graph It (2 tapes) 17.99
Word Processor 119.00
Personal Finance 64.9
Microsoft Basic 75.00
Basketball ROM 27.00
Super Breakout ROM 30.00
Computer Chess ROM 32.00
3D Tic Tac Toe ROM 25.00
Star Raiders ROM 36.00
Kingdom Cassette 12.99
Blackjack Cassette 12.9
Biorhythm Cassette 12.99

Energy Czar Tape 12.95
Telelink (Terminal ROM) 24.00
Space Invader ROM 30.00
Scram 18.95
Asteroid32.00
Missile Command 32.00
Arcade Plus
Ghost Hunter Cassette 25.00
Ghost Hunter Disk 30.00
Datasoft
Atari Mailing List Disk 19.95
Atari Character Generator
Disk16.95
Text Wizard Disk 89.95
Micropainter Album 1
Disk
Micropainter Album 2
Disk
Le Stick Accessory 30.00
On-Line Systems
HI-RES Adv #0 — Mission:
Asteroid Disk 19.95

HI-RES Adv #2 — Wiz & Princess Disk
The Next Step Disk 29.95
Personal Software
Visicalc Disk 169.00
FOR HOME ENTERTAINMENT
SYSTEMS:
Activision
Dragster Cartridge 18.50

Boxing Cartridge	18.50
Checkers Cartridge	18.50
Fishing Derby Cartridge	18.50
Skiing Cartridge	18.50
Bridge Cartridge	23.95
Tennis Cartridge	18.50
Laser Blast Cartridge	18.50
Freeway Cartridge	18.50
Kaboom! Cartridge	18.50
Stampede Cartridge	18.50
Ice Hockey Cartridge	23.95



1198 E. Willow St., Signal Hill, CA 90806

#### ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE. CALL FOR BEST PRICE

ASAP offers a 15-day buyer protection policy: full money-back guarantee if not totally satisfied. Ordering information: name, address, phone; ship by: UPS or Mail. Shipping charge: add \$2.50 up to 1 lb. (UPS blue), U.S. Mail add \$1.50 (U.S. only) (\$25.00 minimum order).

Terms: We accept cash, check, money orders, Visa and Master Charge (U.S. funds only). Tax: 6% Calif. res., COD's and terms available on approval (School PO's Accepted).

Toll free outside California: (800) 421-7701. Inside California: (213) 595-6431 (714) 891-2663.

May-July

Speech Synthesis and Recognition, various sites throughout the U.S. This four-day seminar is for product development and design engineers, systems analysts, programmers, and technical managers who will be involved with the planning, design, and implementation of voice input/output (VIO) systems. Among the topics to be covered are understanding voice-processing algorithms and software, evaluating available VIO hardware components and systems, and using speech-synthesis techniques. In-class presentations of VIO systems, components, and techniques will illustrate discussions. The course fee is \$795. Contact Ruth Dordick. Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405, (800) 421-8166; in California, (800) 352-8251.

May-July

Structured Design and Programming, various sites throughout the U.S. This four-day course emphasizes the development of skills that facilitate the efficient production of reliable, well-documented, and maintainable programs, on time and within budget. Some of the topics to be addressed are structured software design methods, how to write structured programs for mini- and microcomputers, and how to improve program readability and reliability. The course fee is \$795. Contact Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405. (800) 421-8166; in California, (800) 352-8251.

May-July

Technical Classes from Zilog, Campbell, CA. Zilog is offering a series of one- to five-day technical classes at its California-based training facility. Topics range from "Microprocessors: A General Introduction" to "Zeus/System 8000 User." Contact Zilog, Training and Education Dept., 1315 Dell Ave., Campbell, CA 95008, (408) 446-4666.

May-July

Computer Network Design and Protocols, various sites throughout the U.S. This four-day course will focus on the practical aspects of network design, interfacing, protocols, and packet switching. Among the topics to be covered are how to determine system requirements and perform design trade-offs, how to carry out network communication and control protocols, and how to evaluate available network hardware and software components. The course fee is \$845. For complete details, contact Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405, (800) 421-8166; in California, (800) 352-8251.

May-August

Engineering Summer Conferences, Chrysler Center for Continuing Engineering Education, North Campus, University of Michigan, Ann Arbor, MI. Among the conferences being offered are "Interactive Design with Computers," "Applied Numerical Methods," and "Robotics: Concepts, Theory, and Applications." For complete details, contact Engineering Summer Conferences, 200 Chrysler Center, North Campus, University of Michigan, Ann Arbor, MI 48109, (313) 764-8490.

May 9-12

The Seventeenth Annual Meeting of the Association for the Advancement of Medical Instrumentation (AAMI), Hyatt Regency Embarcadero, San Francisco, CA. Approximately 50 scientific and technical sessions will explore such topics as nuclear magnetic resonance imaging, computerized data management for surgical anesthesia monitoring, and patient data management. Exhibits will be featured. For details, contact the AAMI, Suite 602, 1901 North Fort Myer Dr., Arlington, VA 22209, (703) 525-4890.

May 10-12

Dexpo 82, Marriott Hotel, Atlanta, GA. This exposition features DEC- (Digital Equipment Corporation) compatible hardware, software, and services. Contact Expoconsul International Inc., 19 Yeger Rd., Cranbury, NJ 08512, (609) 799-1661.

May 10-13

The Annual Meeting and Technical Conference of the IEEE Industrial Power Systems Department, Marriott Hotel, Philadelphia, PA. For details, contact Dr. Paul Reece, General Electric Co., 6901 Elmwood Ave., Mail Drop 06302, Philadelphia, PA 19142, (215) 726-2800.

May 10-14

Introduction to Microprocessor Systems Engineering, University of Tennessee Space Institute, Tullahoma, TN. For details, contact Jules Bernard, University of Tennessee Space Institute, Tullahoma, TN 37388, (615) 455-0631, ext. 278.

May 10-14

The Twentieth Annual Convention of the Association for Educational Data Systems (AEDS), Sheraton Twin Towers, Orlando, FL. This convention includes presentations on the state of the art in educational computing. Administrative and instructional computing applications will be presented, and new ways

#### In Less Than 3 Minutes

Your IBM Model 50, 60, or 75
Electronic Typewriter
can be an RS232C PRINTER or TERMINAL



CALIFORNIA MICRO COMPUTER Models 5060 and 5061 can be installed easily and require NO modifications to the typewriter.

For additional information contact:

CALIFORNIA MICRO COMPUTER 9323 Warbler Ave., Fountain Valley, CA. 92708 (714) 968-0890

STONEWARE

**GAME AND HOBBY** 

Crush, Crumple & Chomp Jabber Talky

Major League Baseball

\$179°5

88998 s9900

\$65°°

\$299\*\* \$224\*\*

\$259°5

5139°

32

\$2201

\$250

26°

\$2100 240

2495

329

2495

300 3000

320

\$2495 \$2495

\$3200

320

320

\$24\*\* \$30\*\* \$24\*\*

\$24°5 \$32°5

3000 \$32% \$32% \$48%

5329

\$24°5

DB Master Vers. 3

ASC II Express 3.3 Brodebund Payroll

Microbuffer II 16K

Microbuffer II 32K

Grappler Graphic Interface & Cable

Temple of Asphai . Hellfire Warrior . .

Rescue at Rigel

Alien Rain . Apple Panic

Snack Attack Joy Breaker Space Quarks

Genetic Drift

Star Thief . Bug Attack

Trick Shot Dog Fight

Robot War

Falcons . Beer Run

Gorgon

\$499

Raster Blaster Space Eggs

Sargon II . . . . . Pool 1.5 . . . . . . Shuffle Board .

Olympic Decathlon Three Mile Island ABM

Castle Wolfenstein

Zork or Zork II ...

Cops and Robbers Tigers in the Snow

The Battle of Shiloh

The Shattered Alliance Computer Baseball

Computer Quarterback Sneakers

Illtima

Utility Pack I

Snapshot

7-Term (CP/M)



#### SUPER SPECIAL THE NEW APPLE III

Apple III plus 128K Apple III SOS package •12" High Resolution

Green Monitor \$299900

#### HIGHLY RATED BY TAX PROS!

Apple II plus 48K · Apple Disc Drive II w/interface DOS 3.3 • 12" High Resolution

Green Monitor **HOWARD Tax Preparer** 1982

\$199900

#### WORD PROCESSOR SYSTEM

Apple II plus 48K Apple Disc Drive II w/DOS 3.3 12" High Resolution Monitor **OKIDATA Microline 80 Printer** 

Printer cable w/interface • IUS Orig. Easywriter

\$239900

time-sharing videotex display.

EXICON LEX-21 Portable Terminal

**Ecommodore** 

PERSONAL COMPUTER

VIC 20 and RF Modulator

PRICED TOO LOW TO PRINT

Phone Modem f/VIC by Bizcom . . . . 139.95

DATACORDER (f/Cass. Prog.) . . . . . 69.95

VT 106 A 6 Pk. Recreational Prog. . . . . 49.95

8K Memory Expansion . . . . . .

Only \$35900

The world's

lowest cost

Communications

smallest,

lightest,

Printing

Terminal

Lower Case Chip
WORD PROCESSORS IUS - Pro Easywriter 200° IUS - Pro Easywriter 120° Orig. Easywriter 179° Apple Pie (WP 40 Col.) 1105° LJK Letter Perfect 129° Supertext II 129° Supertext II 1129° Superscribe II (70 Col.) 1104° Executive Secretary 200° Magic Window 265°
Edu-Ware Math/Fractions .*34* Math/Decimals

Magic Window
EDUCATIONAL F/APPLI
Edu-Ware Math/Fractions .*34
Math/Decimals\$34
Arithmetic Skills \$43
Algebra I
Compuspell System \$26
Data Disc Lev. 4-5-6-7-8 . ea. *18
CMA Teacher Plus \$44
CMA Teacher Plus Pack 560
PDI New Step-by-Step *69
COSTIMADE SOR APPLE

i billon otop c			~	•	-1	۳.		1	11
SOFTWARE	1	F	C	)	R	1	A	I	PPLE
Fortran 80								÷	. 154
A.L.D.S						÷			1991
Basic Compiler									. \$295
Tasc Compiler									. 149
Cobol - 80								×	. \$595
Context Conne	C	to	)1	١					. 145
U	IS	A	į.						

3239900	Apple World
VP-3501 Videotex Data Term Turn your home TV into a	PC-1500 LED POCK

#### SENSIBLE . \$59°5 The Apple Speller. MICRO PRO Wordstar 3.0 . . Spell Co. \$269° Spell Star Mail Merge Super Sort-1 13900 MICROLAB Data Factory ... \$12000 \$159° Tax Manager

HOWARD SOFTWARE	
Tax Preparer New 1982 119	1
NEW! Real Estate Analyzer	
2nd Addition	ı
PERSONAL SOFTWARE	
Visicalc 3.3	3

AARDVARK			
THE SOURCE Telecommunication			. 19
Desktop Plan III			125
Desktop Plan II			. 119
Visifile			
Visiterm			
Visitrend/Visiplot			
Visidex			.115
Visiplot	ė.		*15
Visicalc 3.3			.518

73731100 77311111	
Personal Tax Plan \$10500	
Individual Tax Plan \$20000	
SYSTEM PLUS	
Accounting Plus II CALL	
ASHTON TATE	
DRace II \$52495	

HIGH TECHNOLOGY	
Info. Master	9
Store Manager	9
Data Master	9
Job Control System 559	5
Client Billing System 9279	9
SOUTHEASTERN SOFTWARE	

	SOFT	AVA	OF.	n						_	
		YY A	N.E.	r	U	DI	 m	11	¥!	v	-
PFS	Common and				41						277
PES	Repo	rt .							'n.		\$779

Data Capture 4.0 40 Col. .

•	PHOENIX SOFTWARE Zoom Graphics	3500
9	Master Diagnostic (Formerly Brain Surgeon) .3	4205



TG Joystick

CE-122 16-DIGIT MINI DOT PRINTER Print out program & program performance CASSETTE INTERFACE: Saves data or programs on cassette tape. Search saved data by file name.

Now Only \$10495

#### \$330 \* SHARP MINI COMPUTERS \*

PC-1500 LED POCKET COMPUTER
Extended BASIC system capable of 2
dimens. arrays. Full graphic commands.

Now Only \$25495 PC-1211 POCKET COMPUTER

Formidable computing power. Program-mable with BASIC language. 24 digit LCD. Now Only \$13995



TI 99/4A COMPUTER NEW LOW PRICE \$32995

FREE! RF Modulator with purchase of TI 99/4A

Full line of Hardware, Software & Accessories IN STOCK! TI LOGO PHM 3040 . . . . .

Buy any 4 TI modules from us & get the New MUNCHMAN & get the New MUNCHMAN ARCADE game free from TI.

OFFER EXPIRES 5/15/82	
ATARI 800 w/16K	. \$69995
ATARI 400	. \$32900
810 Disc Drive	
410 Programmable Recorder	57995
POPILI AR ATARI GAMES IN S	

HEWLETT PACKARD



In One Small Package. HP-85A is a powerful

language computer, complete with keyboard, CRT display, printer and disc drive all in one self contained 20 lb. unit. 16K RAM memory, expandable to 32K

HP-85A New Low Price \$198200 PLUS! 2 Free Software Application Packs \$19000 Value! (WHILE SUPPLY LASTS)

HP-125 New Low Price \$198200 HP 82091 M 51/4" Disc Drive . . . . \$165000 HP 7225B Graphics Plotter .... \$1939°0 HP 82905 B Serial Printer ..... \$74900

We carry the full line of TI and HP Programmable Calculators.

#### THE COMMUNICATOR PACKAGE

Apple II plus 48K · Apple Disc Drive II

w/controller DOS 3.3 DC Hayes Micromodem II

• 12" Green Monitor Source Telecommunication

\$225500

#### BUSINESSMAN'S SPECIAL

Apple II plus 48K · Apple Disc Drive II w/interface DOS 3.3 • 12" High Resolution

Green Monitor Visicalc 3.3 Software

\$207400

THE FAMILY SYSTEM NOW ONLY \$209900

**NEW! FIBERBUILT CASE** 

FOR APPLE! Apple & 2 Disc Drives Detachable Cover \$6595

PRINTERS

OKIDATA 83A Graphics, 120 CPS, Bidirectional, Friction & Tractor, 136 Col. Serial & Parallel, Takes 15" Paper 729.95

OKIDATA 82A Graphics, 120 CPS, Bidirectional, Friction and Tractor Feed, Serial & Parallel, 80/132 Columns . 489.95 55.00 Tractor Feed, opt.

OKIDATA OKIGRAPH™ Create illustrations, Graphs, Charts or whatever a CRT screen tells it to . 69.00 CENTRONICS 739-I Graphics, 100 CPS

Monospaced Mode, Right Justification, Friction and Tractor ..... XEROX Diablo 630 with word process-2399.00

ing enhancement. Bi-directional Tractor (optional) .. 205.00 Letter Quality Printer . . . . . . . .

C.ITOH 8510 Pro Writer, 120 CPS, 136 Columns, Parallel, Bidirectional, F/T, High Resolution Graphics . . . . . 519.00

NEC 8023 Pro Writer, 100 CPS, 136 Col. Parallel, Bidirectional, Tractor and Fric tion, High Resolution Graphics .. 519.00 **EPSON** 

MX-80 . . 449.00 MX-80FT . . 579.00

MX-100FT .739.00 MONITORS

SANYO VM-4509 9" B&W . . . . 169.95 SANYO DM-8112CX 12" Green . . 269.95 SANYO DMC-6013 13" Color . . . 449.95 NEC JB1201 12" Green .... 179.95 NEC JC1201 12" Color 349.95

#### CORPORATE ACCOUNTS WELCOME Cameras - Electronics - Audio - Video - Computers - Darkroom - Accessories ©1982

57.95

Call for low price!

67 West 47th Street, New York, N.Y. 10036 115 West 45th Street, New York, N.Y. 10036 MAIL ORDER ADDRESS: 36 E. 19th St. New York, N.Y. 10003



**TOLL FREE OUT-OF-STATE** 

(212)260-4410

Items on sale for limited time only, and are subject to limited availability. Not responsible for typographical errors. This ad supersedes all other ads prior to May '82 Prices effective as of March 23, 1982, and are subject to change without notice. All orders subject to verification and acceptance. Minimum shipping and handling \$4.95

®

of improving educational processes will be explored. Contact AEDS, 1201 Sixteenth St. NW, Washington, DC 20036. (202) 833-4100.

May 11

DEC-Compatible Show, Omni International, Atlanta, GA. This conference for Digital Equipment Corporation (DEC) users is sponsored by MDB Systems. It is designed to provide users with selection assistance and application support for a wide range of products. Contact MDB Systems Inc., 1995 North Batavia St., Orange, CA 92665, (714) 998-6900.

May 14-15

The Second Annual Southern California Computers-in-Education Conference, University High Scool, Irvine, CA. This conference covers the application of computers in education from kindergarten through two-year college. All areas of curriculum will be covered, including reading, mathematics, science, language, and special education. Hands-on workshops and field trips are planned. Contact Craig Walker, Arrowview Intermediate School, 2299 North G St., San Bernardino, CA 92405, (714) 886-9118.

Applefest/Boston, Hynes Auditorium, Boston, MA. This show will feature more than 200 displays and booths of Apple-compatible products and accessories. Seminars and panel discussions will be held. Ticket prices are \$6 per day or \$15 for a three-day pass. Contact National Computer Shows, 824 Boylston St., Chestnut Hill, MA 02167, (617) 739-2000.

May 15-16

The North American Computer Othello Championship, Learning Resources Center, Andersen Hall, Northwestern University, Evanston, IL. This two-day tournament is sponsored by the United States Othello Association. Champions will be determined in three categories: microcomputer systems (located on site), mainframe systems (telephone hookup), and specialpurpose Othello machines. For complete tournament details, write to Professor Peter W. Frey, Dept. of Psychology. Northwestern University, Evanston, IL 60201.

May 16-21

Advanced DP Training Management Workshop, Los Angeles, CA. This workshop is intended for training managers directly responsible for planning, monitoring, and evaluating data-processing training and reporting to upper-level management. The prerequisite for this workshop is completion of Deltak's Training Managers' Workshop (see May 23-28) and a minimum of one year's experience since completion or the equivalent on-the-job experience. The registration fee is \$850. Contact Linda Hubacek, Deltak Inc., 1220 Kensington Rd., Oak Brook, IL 60521, (312) 920-0700.

May 17-21

Graphics Interface 82, Toronto, Ontario, Canada. This conference and exhibition is sponsored by the Canadian Man-Computer Communications Society and the National Computer Graphics Association of Canada. Papers and speakers will address a wide variety of topics, including man-computer interaction, animation, graphics algorithms, and computer-aided design and manufacturing. For details, contact Rich MacKay, Dataplotting Services Inc., 160 Duncan Mills Rd., Don Mills, Ontario M3B 1Z5, Canada, (416) 447-8518.

May 18-20

Microcomputers in Education, Gutman Library, Cambridge, MA. This series of workshops is designed for educators at all levels. Topics include an overview of the educational uses of microcomputers, BASIC and graphics, Pascal, and the administrative uses of microcomputers. Hands-on experience will be emphasized. For information, contact Technical Education Research Centers, 8 Eliot St., Cambridge, MA 02138, (617) 547-3890.

May 18-20

Northcon/82 High-Technology Electronics Exhibition and Convention, Seattle Center Coliseum, Seattle, WA. Contact Electronics Conventions Inc., 999 North Sepulveda Blvd., El Segundo, CA 90245, (800) 421-6816; in California, (213) 772-2965.

May 19-21

Computer Hong Kong 82, Regent Hotel, Hong Kong. This three-day program, which embraces the Fifth Hong Kong Computer Conference, will focus on the electronic data-processing market. For further details, contact Kallman Associates, 5 Maple Court, Ridgewood, NI 07450, (201) 652-7070.

May 20-21

The Third Annual Computer Law Institute, Los Angeles, CA. This institute will provide an in-depth program on antitrust, proprietary rights, and contractual issues confronting the computer industry. Among the topics to be covered are fair trade practices and the negotiation and structuring of distributor, dealer, and original equipment manufacturer contracts. Contact Ami Silverman, University of Southern California Law Center, University Park, Los Angeles, CA 90007, (213) 743-2582.

May 20-21

The Third Annual Electronic Mail Seminar, BBN Conference Center, Cambridge, MA. This seminar is designed for anyone investigating, planning, implementing, or expanding computer-based message systems. The technical, social, and managerial issues involved in a successful electronic mail program will be studied. Hands-on experience will be provided. Contact BBN Information Management Corp., 10 Moulton St., Cambridge, MA 02238, (617) 497-2929.

May 21-23

The 1982 Computer Showcase Expo, Boston, MA. The Computer Showcase is designed for small-business owners, independent professionals, and corporate managers. Admission is \$7.50. For further details, contact the Interface Group, 160 Speen St., POB 927, Framingham, MA 01701, (800) 225-4620; in Massachusetts, (617) 879-4502.

May 22

The First Regional Conference on Technology and Special Education, Mill Neck Manor Lutheran School for the Deaf, Mill Neck, NY. Sponsored by the New York State Association for Educational Data Systems, this conference will focus on computer applications in special education for administrators, teachers, and parents. Contact Dr. Dolores Shanahan, Commack Public Schools, Indian Hollow Computer Laboratory, Kings Park Rd., Commack, NY 11725, or Jerry Burke, Half Hollow Hills High School, Dix Hills, NY 11746.

May 22

The Third Annual New Jersey Microcomputer Show & Flea Market, Holiday Inn (North), Newark International Airport, Newark, NJ. This event will feature more

# PERSONAL COMPUTERS PERSONAL COMPUTERS PERSONAL COMPUTERS



Amdek Video-300	199.00
Amdek Color-1 Monitor	359.00
Atari 400 16K	349.00
Atari 810 Disk Drive	449.00
Atari 850 Interface	169.00
Atari 830 MODEM	159.00
Atari 800 16K	749.00
Diablo 630	2095.00
Epson MX-70	
Epson MX-80 FT	
Epson MX-100 FT Printer	
Hayes Micromoderm II (Apple II)	299.00
Microtek 16K Ramboard for	
Atari 800,	79.00
Microtek 32K Ramboard for	
Atari 400 & 800	
M&R Sup-R-Terminal	279.00
Microsoft Soft Card (Z-80)	279.00
Microsoft Ramcard 16K for Apple	159.00
NEC 3510 Spinwriter	
NEC 3515 Spinwriter	
NEC 3530 Spinwriter	
NEC PC-8023 Printer	569.00
NEC JC1201 M(A) – Color 12" Monitor	359.00
NEC GREEN JB1201M – 12" Monitor	169.00
Okidata Microline-80 Matrix Printer	329.00
Okidata Microline-82A	499.00
Okidata Microline-83A	729.00
Televideo 910	559.00
Televideo 912C	669.00
Televideo 920C	749.00
Televideo 925	849.00
Televideo 950	929.00

800-343-0873

Stock Shipments Same Day or Next No Surcharge for Credit Cards All Equipment Factory Fresh w/MFT Warranty Prices do not Reflect Shipping Charges Mass. Residents Please Add 5% Sales Tax

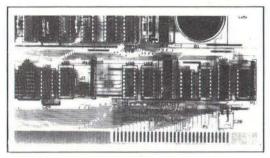
PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

# OMEGA SALES COMPANY

(Not an affiliate with Omega Sales Co., Inc., A Delaware Corporation)

430 PEARL STREET, STOUGHTON, MA 02072 (617)344-6645

#### IBM Personal Computer 128 K + Clock/Calendar



#### 64k of parity checking memory PLUS battery supported Clock/Calendar.

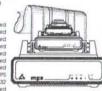
- Solid Electrolyte (Lithium Iodide) battery eliminates leakage problems.
- Two or less standard loads per I/O pin per IBM specification.
- Gold flashed edge fingers and plated through holes for high reliability.
- 64k & Clock/Calendar ... \$445. 128k & Clock/Calendar.. \$540.

Tenley Design, Inc.

PO Box 39155 Wash DC 20016

#### STOCK ORDERS SHIPPED IN 24 HOURS

diustable Tractor Feed Standard **IOOCPS** umber of Column





#### DISC DRIVES

QUME: DT-8...\$525.00' art.-1 DT-5...\$310.00' aty.4

TANDON: TM-100-2...\$335.00'err-1

TM-100-4...\$425.00' err.

TM-848-2...\$550.00'erv-1

TM-848-1...\$475.00' erv.1

TM-602...\$995.00' arr.1 TM-603...\$1175.00' arr.1

**QUME LETTER QUALITY** PRINTERS SPRINT 9/45 \$2245" ....



(408) 438-5454

4444 SCOTTS VALLEY DR., SCOTTS VALLEY, CA 95066 TERMS: Cashiers Check, VISA, M/C, COD Shipping charges added to all ord \* Quantity Discounts Available



#### **Event Queue.**

than 50 commercial exhibitors and 150 flea market sellers. Hardware, software, and accessories for all popular systems will be featured. Contact Kengore Corp., 3001 Rte. 27, Franklin Park, NJ 08823, (201) 297-2526, for additional information.

May 23-28

DP Training Managers' Workshop, Dallas, TX. This workshop is intended for individuals with less than 18 months' experience in coordinating data-processing training programs. Participants will learn to establish in-house education programs that will meet management objectives and ensure a high return on their organization's investment in training. The registration fee is \$850. Contact Linda Hubacek, Deltak Inc., 1220 Kensington Rd., Oak Brook, IL 60521, (312) 920-0700.

May 25-27

Electro/82 High-Technology Electronics Exhibition and Convention, Hynes Auditorium, Commonwealth Pier, and Sheraton-Boston Hotel. Boston, MA. Contact Electronics Conventions Inc., 999 North Sepulveda Blvd., El Segundo, CA 90245, (800) 421-6816; in California, (213) 772-2965.

May 31-June 4

Personal Microcomputer Interfacing and Scientific Instrument Automation, Virginia Polytechnic Institute and State University, Blacksburg, VA. This workshop is designed to teach users how to interface and use personal computers in instrumentation and automation systems. Hands-on experience working with and designing interfaces for personal computers will be featured. Contact Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg, VA 24061. (703) 961-4848.

#### June 1982

Knowledge Engineering in the 1980s, Chicago, IL. Expert Systems are computer programs that reason in tasks requiring considerable human expertise, such as locating computer malfunctions, monitoring intensive care patients, analyzing noisy signal data, and diagnosing medical problems. This one-day executive briefing provides an introduction to the potential benefits and costs of Expert Systems. For further information, contact Dina Barr, Teknowledge, 151 University Ave., Palo Alto, CA 94301, (415) 326-6827.

June-August

Database Concepts and Design, various sites throughout the U.S. Sponsored by the American Management Associations (AMA), this five-day seminar is designed for dataprocessing managers, system designers, and other personnel involved in database activities. Topics include an overview of the database environment; evaluating and measuring performance, costs, and results; determining organizational needs and the systems software to meet them; and implementing, integrating, and supporting the database within company plans and budget. Highlighting this seminar is a comprehensive review of database products. Individual fees are \$850 for AMA members and \$975 for nonmembers. Team discounts are available. Contact AMA, 135 West 50th St., New York, NY 10020, (212) 586-8100. To register by phone, call (212) 246-0800.

June 6-11

Advanced DP Training Management Workshop, Calgary, Alberta, Canada, For details, see May 16-21.



#### BASIC Scientific Subroutines, Vols. I and II

Valuable programs for professional and hobbyist

by Fred R. Ruckdeschel

Designed for the engineer, scientist, experimenter, and student, this series presents a complete scientific subroutine package featuring routines written in both standard Microsoft and North Star BASIC.

- Volume I covers plotting, complex variables, vector and matrix operation, random number generation, and series approximations.
- Volume II includes leastsquares approximation, special polynomial functions, approximating techniques, optimization, roots of functions, interpolation, differentiation, and integration.

Volume I ISBN 0-07-054201-5 336 pages; hardcover 19.95

Volume II ISBN 0-07-054202-3 800 pages; hardcover 23.95

#### Threaded Interpretive Languages

How to implement FORTH on your 7.80

by Ronald Loeliger

This book develops an interactive, extensible language with specific routines for the Zilog Z80 microprocessor. With the core interpreter, assembler, and data type defining words covered in the text, it is possible to design and implement programs for almost any application and equivalent routines for different processors.

ISBN 0-07-038360-X 272 pages; hardcover 18.95

#### Beginner's Guide for the UCSD Pascal System

The most popular Pascal version explained by its creator

by Kenneth L. Bowles

Written by the originator of the UCSD Pascal System, this informative book is an orientation guide to the System. For the novice, this book steps through the System, bringing the user to a sophisticated level of expertise.

Once familiar with the System, the reader will find the Guide an invaluable reference tool for creating advanced applications.

from

The

hard facts

**Byte Books** 

about Software

ISBN 0-07-006745-7 204 pages; softcover 11.95 in BASIC and the other in 8080 assembly language; a p-code interpreter written in both Pascal and 8080 assembly language; a chessplaying program; and an APL interpreter.

ISBN 0-07-037823-1 334 pages hardcover \$25.00

#### The BYTE Book of Pascal

A powerful, structured language Blaise W. Liffick, Editor

Based on articles, language forums, and letters from BYTE magazine, this work is a valuable software resource. Pascal continues to be popular as a structured programming language. Written for both potential and established users, this book introduces the Pascal language and examines its merits and possible implementations. Featured are two versions of a Pascal compiler, one written

**Beyond Games:** Systems Software for Your 6502 Personal Computer

Creating programs for the Apple, Atari, Challenger and PET computers

by Kenneth Skier

At last, a complete programming guidebook. A self-contained course in structured programming and top-down design, this book presents a powerful set of tools for building an extended monitor, disassembler, hexadecimal dump routine and text editor programs.

ISBN 0-07-057860-5 440 pages; softcover

						14.95		
Name			14	Title		Price	Quantity	Amoun
Address								
City		State	Zip					-
	Check Enclosed	Amount						
	Bill Visa/Master Card Number				Add 75¢ per boy	ok to cover shippin	ng	
INS.		Expiration	n		costs:	ok to cover shippin	•ъ	

BYTE Books 70 Main Street Peterborough, N.H. 03458

ORDER TOLL FREE 800/258-5420

Total

# Model EP-2A-79 EPROM Programmer

Apple S-100 SS-50 STD-Bus

Atari

Pet

Kim-1



H-8 H-89 Ohio Scientific SWTP Aim-65

Sym-1

TRS-80

Three years in the field with unsurpassed performance. Software is available for the EP-2A-79 for most all of the microcomputers including the popular CP/M, FLEX, HDOS operating systems. Write or call for specific hardware/software interfacing. Driver packages available for F-8, 6800, 6809, 8080,8085, Z-80, 1802, 6502 and 2650 based systems.

EP-2A-79	115V 50/60 HZ	\$169.00

#### Personality Modules

PM-0	TMS 2708	\$17.00	PM-5	2716, 2758	\$17.00
PM-1	2704, 2708	17.00	PM-5E	2816	35.00
PM-2	2732	33.00	PM-8	MCM68764	35.00
PM-2A	2732A	33.00	PM-9	2764	35.00
PM-3	TMS 2716	17.00	SA-64-2	TMS 2564	39.00
PM-4	TMS 2532	33.00	SA-64-3	2764	39.00

#### Optimal Technology, Inc.

Phone (804) 973-5482

Blue Wood 127

Earlysville, VA 22936

# XCEL® MICROCOMPUTER RETROFIT GRAPHICS



SUPPORT PROGRAMS

•Symbol Generator

Symbol GeneratorGraph Plotter

•3D Generator
•Surface Plotter

Graphics Terminal Emulator
 Second Printer

Screen Printer
 ANADEX
 EPSON
 IDS

(800) 421-1423

IN CALIFORNIA CALL (213) 320-6604

MAXTEK, INC. 2908 Oregon Court, Torrance, CA 90503

Available in Europe from Micronex Ltd., Chew Magna, England 3042 (STD 027-589 3042)

TRS-80-registered trademark Tandy Corp \* Superbrain-trademark Interfec Data Systems
Tektronix registered trademark Tektronix, Inc. CPM-registered trademark Digital Research

#### Event Queue\_

June 6-11

DP Training Managers' Workshop, Philadelphia, PA. For details, see May 23-28.

June 7-9

Microcomputers in Education, Taft School, Watertown, CT. For details, see May 18-20.

June 7-10

The 1982 National Computer Conference, Astrohall, Houston, TX. This show will feature sessions commemorating the twenty-fifth anniversary of the first FORTRAN compiler. For more details, contact the American Federation of Information Processing Societies Inc., 1815 North Lynn St., Arlington, VA 22209, (703) 558-3612.

June 7-11

The Eleventh Annual Meeting of the MUMPS Users' Group. Denver Hilton Hotel, Denver, CO. This conference will embrace a wide assortment of topics relating to the MUMPS computer language, including medical and business applications, small and large MUMPS systems, technical issues, and new areas of opportunity. Roundtable discussions, workshops, and tutorials for new and experienced programmers will be held. Hardware, software, and systems will be exhibited. Contact the 1982 MUMPS Users' Group Meeting, POB 37247, Washington, DC 20013, (301) 779-6555.

June 9-11

The International Conference on Consumer Electronics (ICCE), Arlington Park Hilton, Arlington Heights, IL. The technical program will include papers and panel discussions on such topics as personal computing, computeraided design techniques, home information systems, and videotex, teletext, videodisc, video-cassette recorders, and

cameras. Exhibits will be featured. This conference is sponsored by the Consumer Electronics Group of the IEEE (Institute of Electrical and Electronics Engineers). Contact the IEEE, 445 Hoes Lane, Piscataway, NJ 08854.

June 13-16

The Fifteenth Annual Conference of the Association of Small Computer Users in Education, Chatham College, Pittsburgh, PA. This conference will include papers and demonstrations on the educational and administrative uses of computers. Other topics to be covered are robotics, Pascal programming, computer literacy, and the use of packaged software in computer courses. For more information, contact Jan Carver, Computer Center, Chatham College, Pittsburgh, PA 15232, (412) 441-8200.

lune 14-16

The Fifteenth Power Modulator Symposium, Hyatt Regency Baltimore, Baltimore, MD. This symposuim will focus on the technology, devices, and systems associated with rep-rated power modulators, including switches, auxiliary devices, energy storage, radio-frequency systems, and low-frequency generators. For details, contact Leonard Klein, Palisades Institute for Research Services Inc., 201 Varick St., New York, NY 10014, (212) 620-3377.

June 15-17

The 1982 IEEE MTT-S International Microwave Symposium, Hyatt Regency Hotel, Dallas, TX. The theme of this symposium is "Thirty Years of Microwaves." Papers and tutorials on a wide range of topics, including computeraided design and measurement techniques, microwave field and network theory, as well as satellite communica-

\$175.00

\$175.00

\$345.00

\$395.00

\$395.00

\$65.00

# **SPECIALS**

WE CARRY THE COMPLETE LINE OF ATARI SOFTWARE, PERIPHERALS AND ACCESSORIES. EPSON MX-80

INTERFACES & CABLES
IEEE \$55. RS-232 \$70.
APPLE INTERFACE & CABLE \$90.
TRS-80 CABLE \$35.

**3437.00** W/GRAPHTRAX \$459.00

ATARI 400 16K

ATARI

ATARI

\$339.00

# **PERSONAL COMPUTERS**

Televideo 925	NEC 3510 Spinwriter
Televideo 950	
CBM 8032 Computer	NEC 3530 Spinwriter
CBM 8050 Disk Drive	NEC PC-8023 Printer
CBM 4032 Computer	NEC 7710 Spinwriter
CBM 4040 Disk Drive	
CBM 4022 Printer	
	NEC JC 1201 M(A) — Color 12" monitor 359.00
Microtek 16K Ramboard for Atari 800	Okidata Microline-82A
Microtek 32K Ramboard for Atari 400 and 800 149.00	Okidata Microline-83A
Qume Sprint 9/45 (Full Panel)	Diablo 630
Atari 810 Disk Drive	M & R Sup-R-Terminal
Atari 850 Interface	Microsoft Soft Card (Z-80)
Atari 830 MODEM	Microsoft Ramcard 16K for Apple
Atari 800 16K	Hazeltine 1420
Epson MX-70	Amdek 100 G
Epson MX-80 FT	Anadex DP-9500/9501
Amdek Video-300	Televideo 910
Hayes Micromodem II (Apple II)	Televideo 912C
Sanyo 9" B & W	

#### **CALL TOLL FREE!**

1-800-556-7586

COMPUTER SHOPPING CENTER INC.

12 Meeting St. Cumberland, RI 02864 1-401-722-1027 TELEX 952106

# **COMPUTER SHOPPING CENTER**

We Accept C.O.D.'s • Stock Shipments Same Day or Next • No Surcharge for Credit Cards
• All Equipment Factory Fresh w/MFT Warranty • We Carry the Complete Line of Personal Software
• Prices do not Reflect Shipping Charges
Rhode Island Residents please add 6% Sales Tax



NEC GREEN 12" MONITOR JB 1201M \$159.00



OKIDATA MICROLINE 80A MATRIX PRINTER \$329.00



AMDEK COLOR-1 MONITOR \$339.00



EPSON MX-100 FT PRINTER \$729.00

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

#### **HOW DO YOU KEEP** TRACK OF YOUR SPECIAL PEOPLE?

(customers, suppliers, members, employees, associates, etc.)

#### **EASY - WITH** NAMOR™

The new full feature mail/telephone list program.

- ★ 100% menu driven
- \* Generates, deletes, merges lists
- \* Searches, sorts, modifies entries
- \* Prints 1" label or special list format
- \* Fast entry lookup, easy update

Introductory Offer, \$100 (\$150 after Sept. 30, 1982)

SYSTEM REQUIREMENTS: CP/M®, 56K, terminal with addressable cusor & 80 char, x 24 line screen, single or dual disk, 8" IBM or 51/4" North Star.

CP/M is a registered trademark of Digital Research. NAMOR is a trademark of SHAPE, Inc.

DETAILED INFORMATION AVAILABLE



#### SHAPE, INCORPORATED

SOFTWARE FOR YOUR MICROCOM SOFTWARE FOR YOUR SOF SOFTWARE FOR YOUR MICROCOMPUTER
SOFTWARE FOR YOUR MICROCOMPUTER FOR YOUR MICROCOMPUTER FOR YOUR MICROCOMPLITE FOR YOUR MICROCOMPLITE FOR YOUR MICROCOMPLITE FOR YOUR MICROCOMPUTER FOR YOUR MICROCOMPUTER FOR YOUR MICROCOMPUTER SOFTWARE FOR YOUR MICROCOMPUTE FTWARE FOR YOUR MICROCOMPY OFTWARE FOR YOUR MICROCOM OFTWARE FOR YOUR MICROCOM FTWARE FOR YOUR MICROCOND PTWARE FOR YOUR MICROCOND PTWARE FOR YOUR MICROCOND OFTWARE FOR YOUR MICROCOND FTWARE FOR YOUR MICROCON

FTWARE FOR YOUR MICROCO

FTWARE FOR YOUR MICROCO

FTWARE FOR YOUR MICROCON

FTWARE FOR YOUR MICR WARE FOR YOUR MICROCT HALTER & ASSULIA LES. INC.

HALTER & ASSULIA LES. INC.

AND DATA COMMUNICATIONS
AND AFFORM
AND AFFORM
313.662-2002 ERHALTER & ASSOCIATES

#### Event Queue-

tions/microwave systems, will be presented. Contact J. R. Griffin, Texas Instruments Inc., Mail Stop 3432, POB 405, Lewisville, TX 75067, (214) 462-5693.

June 15-17

The Office Automation Show/Conference, Barbican Centre, London, England. For details on this show and conference, contact Clapp & Poliak International, 7315 Wisconsin Ave., Washington, DC 20014, (301) 657-3090.

June 16-18

The Twentieth Annual Meeting of the Association for Computational Linguistics, University of Toronto, Toronto, Ontario, Canada. This meeting features papers on syntax, computational semantics, discourse analysis and speech acts, machine translation, as well as the mathematical and theoretical foundations of computational linguistics. For additional information, contact Don Walker, Artificial Intelligence Center, SRI International, Menlo Park, CA 94025, (415) 859-3071.

Iune 20-25

DP Training Managers' Workshop, Chicago, IL. For details, see May 23-28.

June 23-26

Productivity 82, Seattle University, Seattle, WA. This conference is sponsored by the Association for Computing Machinery (ACM) and the Canadian Information Processing Society (CIPS). Productivity 82 is designed to emphasize the use of computers to improve productivity in industry and in the office, as well as to improve productivity in the programming of computers. Papers and panel discussions will be featured.

For more information, contact Productivity 82-ACM/CIPS, 10636 Main St. #276. Bellevue, WA 98004.

lune 28-30

COMDEX/Spring '82, Atlantic City Convention Hall, Atlantic City, NJ. For details on this conference and exhibition, contact the Interface Group, 160 Speen St., POB 927, Framingham, MA 01701, (800) 225-4620: in Massachusetts, (617) 879-4502.

Iune 28-30

National Educational Computing Conference (NECC-82), Radisson-Muehlebach Hotel, Kansas City, MO. This conference features papers, sessions, panel discussions, and exhibits of educational computing products. Among the topics to be addressed are "Computer Use in the Physical Sciences," "Computer Education for Teachers," and "Computer Science, Engineering, and Information Systems Education." For more information, contact E. Michael Staman, NECC-82 General Chairman, Computer Services, 305 Jesse Hall, University of Missouri-Columbia, Columbia, MO 65211.

#### July 1982

July 11-15

The International Manufacturing Systems Conference '82, Convention Center, Buffalo, NY. The conference theme is "The Technology of Productivity." More than 100 experts will conduct seminars on a wide variety of topics. Exhibits, vendor presentations, and plant tours are planned. Contact Roy Combs, International Manufacturing Systems Conference, 186 North Water St., Rochester, NY 14604, (716) 232-3950.

# SUBARU OFFERS GREATER TRACTION. AND EVEN GREATER TRACTION.

We congratulate all the car makers who've finally noticed that front wheel drive improves traction. We, however, introduced front wheel drive in 1969. And we just don't think there's any substitute for experience.

As pioneers of front wheel drive, we use this experience to balance all the factors - drive train, steering, weight distribution, suspension — which make for remarkable adhesion to the road. Even around curves, in rain or snow.

The people of Maine, Idaho, Alaska and West Virginia think so much of our front wheel drive that they've helped make Subaru the best selling import in those states! States where good traction is absolutely essential.

But if you want even more traction, we suggest our wagon with On Demand Four Wheel Drive. Which allows you to go from front wheel drive to four wheel drive with the flick of a lever. On Demand, Without stopping,

(Any other 4 wheeler around requires a full stop before switching. And stopping is exactly what you can't do sometimes.)

Both models also help you keep things under control when it comes to gas mileage. So while you're holding on to the road, you can also hold on to your money.

And both offer plenty of room with plenty of options, like power windows, power steering, AM/FM cassette tape deck, cruise control. The works.

But the best option of all is deciding what level of traction you want. Greater. Or even greater.

> SUBARU. INEXPENSIVE. AND BUILT TO STAY THAT WAY.

FWD WAGON

1981 YTD REGISTRATIONS JUNE 1981 R.L. POLK AND COMPANY REPORT

1982 EPA ESTIMATES FOR OUR FWD 5-SPEED WAGON. USE EST. MPG FOR COMPARISIONS. YOUR MILEAGE MAY DIFFER DEPENDING ON DRIVING SPEED, WEATHER CONDITIONS AND TRIP LENGTH. ACTUAL HWY. MILEWAY WILL PROBABLY BE LESS.

TOTAL SUGGESTED POE FOR OUR DL MODELS — NOT INCLUDING DEALER PREP, INLAND TRANSPORTATION, STATE AND LOCAL TAX, LICENSE AND TITLE FEES.
© SUBARU OF AMERICA. INC SUBARU OF AMERICA, INC. 1981 July 13-14

Controlling Electromagnetic Interference, Hyatt Hotel at LA Airport, Los Angeles, CA. This seminar is sponsored by Electronics magazine, a McGraw-Hill publication, and is designed for electronics industry professionals who must make technical or cost decisions based on an understanding electromagnetic interference. Topics of discussion include intersystem problems, designing against environmental noise, how to determine the best frequency for a given application, and the structure and use of intrasystem electromagnetic compatibility models. The fee is \$595; inplant programs can be arranged. Contact Ms. Barbara Bancroft, McGraw-Hill Seminar Center, Room 3112, 305 Madison Ave., New York, NY 10017, (212) 687-0243.

July 18-22

The Fourth General Assembly of the World Future Society, Sheraton Washington Hotel, Washington, DC. The conference theme is "Communications and the Future." All areas of the communications field from telecommunications to interpersonal communication will be covered. The impact of new technologies on society will be explored. Contact the World Future Society, 4916 St. Elmo Ave., Bethesda, MD 20814, (301) 656-8274.

July 19-21

Summer Computer Simulation Conference (SCSC). Marriott City Center Hotel, Denver, CO. The SCSC covers all aspects of computer simulation methodology and applications. Technical sessions and presentations on mathematical methods, model design, simulation languages, and validation techniques will be featured. Information is available from Harvery Marks or Philicia Marks, Transaction Technology Inc., 7648 Capistrano Ave., Canoga Park, CA 91304, (213) 346-5376.

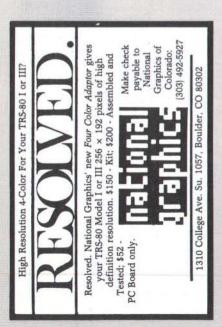
July 21-23

The Computer: Extension of the Human Mind, Eugene Hilton Hotel, Eugene, OR. Sponsored by the University of Oregon College of Education, this conference will feature workshops, speakers, and presentations on the use of computers in education. Topics of interest include preparing teachers to teach with computers, the ethical and social issues associated with computers, and how computers assist learning. The conference fee is \$95: students enrolled in the university's summer session can register for \$55 and earn a single credit hour. For additional information, contact Judy Ohmer, College of Education, University of Oregon. Eugene, OR 97403, (503) 686-3405.

July 25-31

Family Computer Camp, Clarkson College, Potsdam, NY. Each member of your family can gain skill with computers while participating at his or her own level (beginner to expert) and age group (ranging from age 5 to adult). Among the topics to be covered in laboratory and lecture sessions are BASIC programming, word processing, graphics, and home and recreational computer use. Additional details are available from the Conference and Information Center, Clarkson College, Potsdam, NY 13676, (315) 268-6647.

In order to gain optimal coverage of your organization's computer conferences, seminars, workshops, courses, etc, notice should reach our office at least three months in advance of the date of the event. Entries should be sent to: Event Queue, BYTE Publications, POB 372, Hancock NH 03449. Each month we publish the current contents of the queue for the month of the cover date and the two following calendar months. Thus a given event may appear as many as three times in this section if it is sent to us far enough in advance.







LEO ELECTRONICS, INC. 8921 S. Sepulveda #208

# BYTE'S Best Cellar List



Ciarcia's Circuit Cellar, Volumes I, II, & III by Steve Ciarcia

Collections of Steve Ciarcia's perennially popular columns from BYTE Magazine, these three volumes are sure to please home computer users and electronics hobbyists. Volume I includes power conversions, programming EPROMs, remote terminal interfacing, touchinput video display, and more. Volume II, focusing on projects which interface the personal computer with the home, features useful applications such as a computer-controlled home security system, computerized appliances, input-output expansion for the TRS-80, and even a computer-

controlled wood stove. Volume III offers low-cost construction projects such as an ultrasonic rangefinder, handheld remote computer control, two speech synthesizers, and a remote-control motorized platform, to name just a few.

**Build Your Own Z80 Computer** 

This complete guide to building a working computer offers engineers, students, and hobbyists an exciting alternative to buying a computer. With clear instructions, Steve Ciarcia fully explains how to build a basic single-board micro-computer based on the Zilog Z80 microprocessor. The finished product features a 1 K-byte operating system, serial and parallel ports, hexadecimal display, audio cassette mass storage, and easy expansion to include a video terminal.

7	I	T	
1	·	Y	4

Name

#### Please send

\_\_\_\_ Ciarcia's Circuit Cellar, Vol. I \$8.00

\_\_\_ Ciarcia's Circuit Cellar, Vol. II \$12.95

Ciarcia's Circuit Cellar, Vol. III \$12,95

Build Your Own Z80 Computer \$15.95

#### Call Toll-Free 800/258-5420

Check Enclosed

Address Bill Visa/
MasterCard #

City State Zip Expiration Date

BUTE 70

70 Main Street Peterborough, N.H. 03458

Please add .75 per book to cover shipping cost.

B5

#### ATARI HOME COMPUTERS







ATARI 800 16K ... \$679 32K ... \$749 48K ... \$819

ATARI 400				
16K.				\$329
32K.				\$478
48K.				\$555

410 Recorder	\$76.00
810 Disc Drive	\$449.00
822 Printer	\$269.00
825 Printer	\$629.00
830 Modem	\$159.00
820 Printer	\$269.00
850 Interface	\$169.00
New DOS 2 System	\$29.00
PACKAGES	
481 Entertainer	\$83.00
482 Educator	\$130.00

New DOS 2 System	\$29.00
PACKAGES	
181 Entertainer	\$83.00
182 Educator	\$130.00
183 Programmer	\$57.00
484 Communicator	

484 Communicator	\$344.00
ATARI HOME COMPUTER PROGRA	MS
Home Office	
CX404 ATARI Word Processor	\$119.00
CX8102 Calculator	
CX412 Dow Jones Investment Evaluator	\$99.00
CX4109 Graph It, Joystick optional	\$17.00
CX4104 Mailing List	
CX4115 Mortgage & Loan Analysis	
CX406 Personal Financial Management System	
CX4103 Statistics 1	
CX8107 Stock Analysis	
CXL4015 TeleLink 1	\$23.00
Home Study	
CX4101 An Invitation to Programming 1	\$20 00
CX4106 An Invitation to Programming 2	\$23.00
CX4107 Biorhythm	
Conversational Languages (ea.)	\$46.00
CX4121 Energy Czar	\$13.00
CX4114 European Countries & Capitals	\$13.00
CX4108 Hangman, Joystick optional	\$13.00
CX4102 Kingdom	\$13.00
CYL 4007 Music Composer	\$47.00
CX4123 Scram, uses joystick	\$20.00
CX4112 States & Capitals	\$13.00
CX4110 Touch Typing	

PAC MAN	\$35.00
Centipede	\$35.00
Caverns of Mars	\$32.00
CXL4013 Asteroids	\$35.00
CXL4004 Basketball	\$27.00
	\$13.00
CXL4009 Computer Chess	\$33.00
	\$35.00
CXL4008 Space Invaders	\$35.00
CXL4011 Star Raiders	\$42.00
CXL4006 Super Breakout	\$33.00
CXL4010 3-D Tic-Tac-Toe	\$27.00
CXL4005 Video Easel	\$24.00
Programming Languages and Aids	- DATE OF
CXL4003 Assembler Editor	\$47.00
CXL4002 ATARI BASIC	\$47.00
CX8126 ATARI Microsoft BASIC	\$70.00
CXL4018 PILOT	\$72.00
CX405 PILOT	\$105.00

CX30 Paddle	\$18.00
CX40 Joy Stick	\$18.00
CX853 16K RAM	\$89.00
Microtek 16K RAM	
Microtek 32K RAM	
Ramdisk (128K)	
Inteck 48K Board	\$249.00
One year extended warranty	

THIRD PARTY PROGRAMS

Crystal Software Bermuda Fantasy	800.00
Banner Generator	\$11.5
Bowler's Data Base	\$13.0
Weekly Planner	\$15.50
Family Cash Flow	\$15.50
Number Blast	\$11.5
Mapware	\$18.0
My First Alphabet	\$25.5
Insomnia	\$15.5
Instedit	\$15.5
Chameleon	\$15.5
Data Management	\$15.5
Supersort	\$15.5
Disk Fixer	\$15.5
Solitare	\$15.5
Domination	\$15.5
Reversi II	\$15.5
Blackjack Casino	\$15.5
Attack!	\$15.5
Downhill	\$15.5
Dog Daze	\$15.50
Babel	\$15.50
747 Landing Simulation	\$15.50
Outlaw	\$15.50
Avalanche	\$15.50
Eastern Front '41	\$25.5

	Banner Generator	\$11.50
,		911.50
	Crystal Software	***
	Bermuda Fantasy	\$26.00
	Beneath Pyramids	\$20.00
	Galactic Quest	\$26.00
	House of Usher	\$20.00
	Forgotten Island	\$26.00
	Haunted Palace	\$33.00
	Compumax (Acct. Rec., Gen. Ledger,	
	(Inventory, Payroll, ea.)	\$110.00
	Visicalc	\$169.00
	Letterperfect (Word Processor)	\$109.00
	Ricochet	\$14.50
	Crush Crumble & Chomp (cassette or disk)	\$24.00
	Star Warrior (cassette or disk)	\$29.00
	Rescue at Rigel (cassette or disk)	\$24.00
	Datestones (cassette or disk)	\$16.00
	Invasion Orion (cassette or disk)	\$18.50
	Mission Asteriod	\$22.00
	MouskATTACK	\$31.00
	The Next Step	\$34.00
	Softporp	\$27.00
	Wizzard & Princess	\$29.00
	K-BYTE Krazy Shoot Out (ROM).	\$39.00
	Protector (Disk 32K)	
	Jaw Breaker (on line disk)	
	Ghost Hunter (cassette)	
	Ghost Hunter (disk)	100000000000000000000000000000000000000
	THE PARTY OF THE P	_

#### **PRINTERS**

Centronics 739-3	\$619.00
Centronics 739-1	\$519.00
Diablo 630 Special	
Epson	
MX70	\$359.00
MX80	\$469.00
MX80FT	Call
MX100	
NEC	
8023	\$549.00
7730	
-7720	
7710	
Okidata 82A 83A 84 Citoh Starwriter	\$769.00
F10-40 CPS	1460 00
F10-55 CPS	Call
445G	\$699.00
460G	
560G	
Tailey	* / 123/32
	\$1399.00
8024.L	
MPC Apple Parallel Board & Cable	

# XEROX.

Xerox 820	
System I 5' +"	\$2450.00
System II 8"	\$2950 00
CPM 51+	
NAME OF TAXABLE PARTY.	\$429.00
Super Calc	\$269.00

#### **Texas Instruments**



#### TI-99/44 \$299

II OUTTA LOU	
PHA 2100 R F Modulator	\$43 00
	\$179.00
FIT 1700 H3 232 Accessories	\$179.00
PHP 1800 Disk Drive Controller	\$239 00
PHP 1250 Disk Memory Drive	\$389 00
PHP 2200 Memory Expansion (32K RAM)	\$319.00
PHP 1100 Wired Remote ControllersiPairi	\$31 00
32K Expansion	\$329.00
PHP Printer Solid State	\$319.00
PHM 3006 Home Financial Decisions	\$26.00
PHM 3013 Personal Record Keeping	\$43.00
PHD 5001 Mailing List	\$60.00
PHD 5021 Checkbook Manager	\$18 00
PHM 3008 Video Chess	\$60 00
PHM 3010 Physical Fitness	\$26 00
PHM 3009 Football	\$26 00
PHM 3018 Video Games I	\$26 00
PHM 3024 Indoor Soccer	\$26 00
PHM 3025 Mind Challengers	\$22 00
PHM 3031 The Attack	\$35 00
PHM 3032 Blasto	\$22 00
PHM 3033 Blackjack and Poker	\$22 00
PHM 3034 Hustle	\$22 00
PHM.3036 Zero Zap	\$18 00
PHM 3037 Hangman	\$18 00
PHM 3038 Connect Four	\$18.00
PHM 3039 Yahtzee	\$22 00
Tombstone City 21st Century	\$34.00
Munch Man	. \$34.00
TIINVADERS	. \$34.00
CAR WARS	\$34.00

All items subject to availability and price change.

## computer mail order west CALL TOLL FREE

Franco Habla Espanol

IN NEVADA, CALL (702) 588-5654 P.O. BOX 6689, STATE LINE, NEVADA 89449

Home Entertainment





#### HP•85 \$1999

80 Column Printer	\$799.00
HP •125	
HP•83	\$1699.00
HP+85 16K Memory Module	
51/4 " Dual Master Disc Drive	\$1929.00
NEW! HP+87	\$1999.00
Hard Disk w/Floppy	\$4349.00
Hard Disk	\$3440.00
"Sweet Lips" Plotter	
	100

HP•41CV Calculator	\$249.00
41 C	\$189.00
11 C	\$119.00
12 C	\$129.00
34 C	\$117.00
38 C	\$119.00
HP•41 Printer	\$340.00

#### HPIL CALCULATOR PERIPHERALS

IL Modual	\$104.00
Digital Cassette	\$449.00
Printer/Plotter	\$419.00
Card Reader	\$164 00
Optical Wand	\$99.00

## NEC

8001-A	\$669.00
8031	\$669.00
8012	\$549.00

#### **Disks**

Maxell	
MD I (box of 10)	\$36.00
MD II (box of 10)	\$46.00
MFD I (8")	\$44.00
MFD II (8" Double Density)	
Syncom (box of 10)	\$29.00

#### **Apple**

Call for availability and prices on all Apple computers and peripherals.

#### **Monitors**

Amdex 12" B&W	\$129.00
12" Green	\$139.00
13" Color	\$349.00
NEC	
12" B&W	\$169.00
	\$339.00
	\$349.00

# (xcommodore BUSINESS MACHINES

SOFTWARE	
Word Pro 5 Plus	\$319 00
WordPro4 Plus	\$299.00
WordPro3 Plus	\$199.00
Commodore Tax Package	\$589.00
Visicalc	\$169.00
Visicalc	\$449.00
The Source	\$89.00
OZZ Information System	
Dow Jones Portfolio	
Pascal	
Legal Time Accounting	
Word Craft 80	
Power	
Socket-2-Me	
Jinsam	
MAGIS	\$ Call
MAGIS	\$209.00
Softrom	
Real Estate Package	
BPI Inventory Control	
BPI Job Costing	
BPI Payroll	\$319.00
BPI General Ledger	\$329.00
Creative I SAM	
Creative General Ledger	

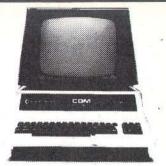
#### VIC 20 \$259

#### COMPLETE

Creative Accounts Receivable

Creative Inventory

VIC 6 Pack Program	\$44.00
VIC 1530 Commodore Datassette	\$69.00
	\$499.00
	339.00
	\$32.00
VIC 110 8K Memory Expander	\$53.00
VIC 1011 RS232C Terminal Interface	\$43.00
VIC 1112 VIC IEEE-488 Interface	\$86.00
VIC 1211 VIC 20 Super Expander	\$53.00
VT 232 VICTerm I Terminal Emulator	. \$9.00
VIC 1212 Programmers Aid Cartridge	\$45.00
VIC 1213 VICMON Machine Language Monitor	\$45.00
VIC 1901 VIC AVENGERS	\$23.00
VIC 1904 SUPERSLOT	\$23.00
VIC 1906 SUPER ALIEN	\$19.00
VIC 1907 SUPER LANDER	\$23.00
VIC 1908 DRAW POKER	\$23.00
VIC 1909 MIDNIGHT DRIVE	\$23.00



#### CBM 8032 \$1069

	3.9
4032	\$969.00
4016	\$769.00
8096 Upgrade Kit	
Super Pet	
2031	\$529.00
8050	
4040	
8300 (Letter Quality)	\$1799.00
8023	
4022	\$599.00
Pe: to IEEE Cable	\$37.00
IEEE to IEEE Cable	\$46.00
Tractor Feed for 8300	
8010 Modem	\$229.00

# 

Terminal	\$13.00
Un Word	\$13.00
Grafix Menagerie	\$11.00
VIC PICS	\$15.00
Ticker Tape	\$13.00
Banner Headliner	\$13.00
RS 232	\$39.00
VT 106A Recreation Pack A	\$44.00
VT 107A Home Calculation Pack A	\$44.00
VT 164 Programmable Character/Gramegraphics	\$12.00
Household Finance	\$27.00
VIC Games	\$19.00
VIC Home Inventory	\$13.00
VIC Rec/Ed II	\$13.00
VL101 Introduction to Computing	\$19.00
VL 102 Introduction to BASIC Programming	\$19.00
VM110 VIC 20 Programmers Reference Guide	\$15.00

In-stock items shipped same day you call.

No risk, no deposit on C.O.D. credit card or phone orders. No waiting period for certified checks or money orders. All prices shown are cash prices, add 3% for Master card and Visa. Pre-paid orders receive free shipping in the continental United States.

#### **Terminals**

Televideo	
910	\$579.00
912C	\$699.00
920C	\$749.00
950	\$939.00
Call for computers	
Zenith Z19	\$749.00
Adds	\$549.00

#### **Modems**

	Novation Auto	\$239.00
	D Cat	\$169.00
	Cat	\$159.00
•	Hayes -	
	Smart	\$239.00
	Livermore Star	

Nev. & Pa. residents add sales tax.

# computer mail order east

INTERNATIONAL CALLS AND IN PA. CALL (717) 327-9575 477 E. THIRD ST., WILLIAMSPORT, PA 17701

Patricio Habla Espanol

# **CHEDIT**

#### A Graphics-Character Editor

Define your own character set for Apple Pascal.

Jerry N. Sweet 30 Willow Tree Lane Irvine, CA 92715

Apple's Pascal system provides the graphics character set SYS-TEM.CHARSET, which manipulated with the TURTLE-GRAPHICS procedures WSTRING, WCHAR, and CHARTYPE. These procedures allow you to employ limited graphics text on displays when the various hardware modes (text only, graphics only, and partially mixed text and graphics as described in the manuals) are insufficient. However, no presently supplied program allows you to edit the character set. Therefore, you are stuck with those characters defined by Apple, as nice as they may be. Herein lies a remedy.

The CHEDIT program allows editing of Apple-format graphics character sets (see listing 1). Although the program is easy to use, it has a number of idiosyncrasies because of its short implementation time. It is not entirely orthogonal and does not contain bulletproof input procedures.

The format of CHEDIT is loosely based on a program of the same name written for the Terak 8510a microcomputer by Keith Allan Shillington. His program was reasonably fast

because it used all kinds of UCSD Pascal magic and byte-manipulation intrinsic procedures. However, there was no documentation available internal or external to the program, making it difficult to understand. In contrast, CHEDIT is quite slow in spots, but quite easy to read and understand.

#### Execution

Because the program uses TUR-TLEGRAPHICS procedures, the SYS-TEM.LIBRARY must be online when CHEDIT is executed. In addition, since the program makes use of the SYSTEM.CHARSET file prompts, it too must be online. If you are using a nongraphic display (e.g., an 80-column CRT), make sure that the graphics-output device is hooked up (i.e., your TV set). When everything is in order, execute the program (enter X followed by CHEDIT). You are confronted with the prompt IN-PUT FILE. Then, you must give the name of a file containing a graphics character set. Initially, this will probably be SYSTEM.CHARSET. You are then asked for the name of the output file. I suggest something like TEMP.CHARSET for starters, unless you have something specific in mind, like APL.CHARSET.

Once these preliminaries are out of the way, an 8-row by 16-column character menu is set up in the lower center portion of the screen, an 8-row by 7-column editing pallet is set up in the upper right-hand portion, and a new prompt appears in the upper lefthand portion. This is your cue to select a character for editing (see table 1 on page 440).

#### Character Selection

The prompt at this stage is ABORT, QUIT, MAKE CHARACTER. The appropriate replies are A, to abort the program and editing (you are asked to confirm this with Y or N); Q, to terminate editing and save the result in the output file; and M, to perform character selection and editing.

Once you have typed M to make a character, the prompt '.' ACCEPTS, UP, DOWN, LEFT, RIGHT appears accompanied by a flashing cursor that is placed initially in the upper left-hand corner of the character menu. Two methods are used to

Text continued on page 440



## **GETS FILES ACROSS!**

With **REFORMATTER** disk utilities you can read and write IBM 3740 and DEC RT-11 single density formatted diskettes on your CP/M<sup>®</sup> system.

 REFORMATTER enables you to access large system databases, improve data exchange with other organizations, increase program development capabilities, and use your micro in distributed processing.

**REFORMATTER** programs feature bi-directional data transfer and full directory manipulation. ASCII/EBCDIC conversion provided with CP/M ↔ IBM. MP/M II is now fully supported.

Program Data Sheets, Application Guides, and Machine Compatibility Guides available.

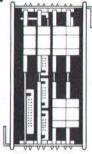
Each program**\$249.00** from stock. Specify CP/M ↔ IBM or CP/M ↔ DEC. Order from MicroTech Exports, Inc., 467 Hamilton Ave., Suite 2, Palo Alto, CA 94301 □ Tel: 415/324-9114 □ TWX: 910-370-7457 MUH-ALTOS □ Dealer and OEM discounts available.

CP/M® is a registered trademark of Digital Research.

# DEC LSI-11 Components

Dependable service at discount prices

Domestic and Export

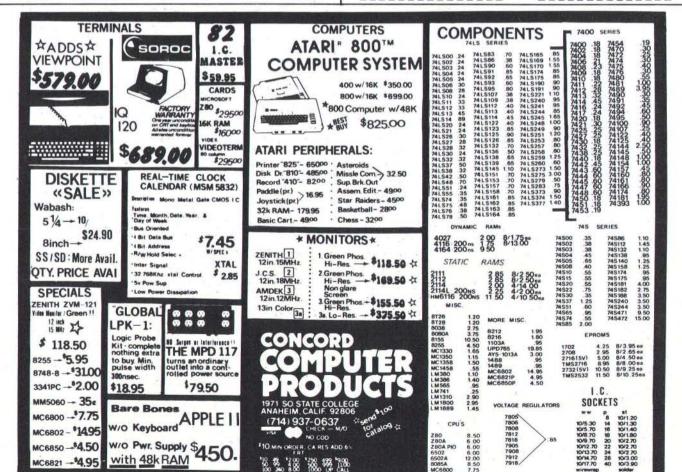


#### Mini Computer Suppliers, Inc.

25 Chatham Rd., Summit, N.J. 07901 Since 1973

(201) 277-6150

Telex 13-6476



# S SAVE S

CALL MBC. . . (203) 342 2747

#### Mainframes

	28002 ( 10 ME				67.400	n
11 11	20 ME	G HI	)		\$1699	90
ALTOS	SYSTEM	S				
	8000-2					
ACS	8000-6	14	MEG	HD	\$899	90
ACS	8000-1	0 10	) MEG	HD	\$689	15
COMMO						
CBM	9000 S	UPE	RPET		\$169	99
CBM	8300 L	ETT	ER QU	ALIT	Y \$199	90
CBM	8023 (	1320	COL, 1	50CP	5)\$ 79	99
CBM	8052 2	MEI	D FD		\$175	50

#### THE HEWLETT



HEWLETT-PACKARD	
HP-87 \$1995	
HP-85 \$2190	
HP-83 \$1790	
HP-125 \$2190	
HP CALCULATORS - 20% OFF \$\$\$	
XEROX SYSTEMS	
810 5 1/4 FLOPPY SYS \$2395	
820 8 " FLOPPY SYS \$2990	
NORTH STAR	
HRZ-1Q-64K-HD5 SAVE \$1600 \$\$\$	
ADVANTAGE 64K-QD \$3350	
INTERTEC SUPERBRAIN	
64K-DD \$2975	
64K-QD \$3380	

	D	ISKE	PTS		
SINGLE	SIDE	(BOX	OF	10)	\$24.50
DOUBLE		(BOX	OF	10)	\$35.00
CABLES.					\$17.95
0.110.000		M/F			\$18.95

#### Printers

OLYMPIA ES-100 TYPEWRITER	
WITH, RS-232, PARALLEL, IEEE \$1250	
IDS PRISM-80 (200CPS) F/T \$ 999	
PRISM-80 COLOR \$1350 560G - 132 \$1090	
PRISM-132 COLOR F/T \$1690	
CENTRONICS 739-1 S 560	
739-3 \$ 675	
OKIDATA MICROLINE 82A \$ 495	
MICROLINE 83A \$ 749	
EPSON MX-80, MX80-F/T, MX-100 \$\$\$	
IN STOCK INCLUDING CARDS&CABLES	
ALWAYS COMPETATIVELY PRICED \$5	
C. ITOH F-10 40CPS \$1490	
NEC SPINWRITER 7710/7730 \$2590	
NEC SPINWRITER 3510/3530 \$1950	
NEC SPINWRITER 7720 KSR \$2890	
ANADEX 9500/9501 \$1225	

ABOVE ITEMS MAY BE ORDERED BY MAIL OR PHONE. FACTORY SEALED, MANUFACTURERS WARRANTY INCLUDED -- PRICES SUBJECT TO CHANGE-

#### Multi-Business Computer Systems Inc.

28 MARLBOROUGH STREET PORTLAND, CONN. 06480 TWX/TELEX 710-428-6345 Listing 1: The CHEDIT program listing, designed for the Apple II. The program requires 48K bytes of memory, the Language System card, and the Apple Pascal package.

```
($5+)
program MakeGraphicChars;
(version [3], June 21, 1981 by Jerry Sweet)
uses TurtleGraphics; (kindly provided by Apple Computers, Inc.)
const xmin = 0; ymin = 0; xmax = 279; ymax = 191; (screen parameters) xboxcorner = 216; yboxcorner = 119; (exploded character
                                                                     {exploded character box}
       HellFreezesOver = false;
                                (number of rows of characters)
       CharRows = 8;
        TopRow = 6;
                                 (top-most row of display)
                               (number of characters per row)
yblocksize = 13; ("logical" character block size)
       CharsPerRow = 16;
        xblocksize = 12;
                                                       (sizes less one)
        xbmax = 11;
                                ybmax = 12;
title = 'Graphic character generator, version [31, 25-Jun-81';
type legalset = set of char;
      onebit = 0..1:
      block = packed array [0..7, 0..7] of onebit;
cblock = packed array [0..ybmax, 0..xbmax] of onebit;
charimage = packed array [0..7] of 0..255;
Charset = packed array [0..127] of charimage;
      Charfile = file of Charset;
      color = (fblack, fwhite); (turtle graphics uses 'black' and 'white')
      ortho = (horizontal, vertical);
var filler : array [color] of cblock; {exploded character 'bits'}
     filename, cnum : string;
icfile, cfile : Charfile;
     selx, sely : integer;
   procedure wrxy (x, y : integer);
   ( places the turtle at the logical character position (x, y), where
     (0, 0) is the at the top-left corner of the screen )
   begin
     if x < 0 then x := 0 else if x > 39 then x := 39;
     if y < 0 then y := 0 else if y > 22 then y := 22;
pencolor (none); moveto (x * 7, ymax - (y + 1) * 8)
   procedure wr (p : string; x, y : integer);
( writes the prompt p at the logical text position (x, y), unless the
prompt is null, in which case the screen is cleared from lines x through
   y. )
var i, j : integer;
   begin
         length (p) > 0 then begin wrxy (x, y); wstring (p) end
        for i := 0 to y - x do begin
          wrxy (0, x + i); for j := 1 to 30 do wchar (' ')
        end
   end:
   procedure wrst (p : string; x, y : integer);
    var i : integer;
      'wr (p, x, y); for i := length (p) + x to 29 do wchar (' ')
   end:
   procedure rd (p : string; x, y : integer; var s : string);
( writes the prompt p at the logical text position (x, y), then
  reads, character-by-character (echoing), and returns s )
const bs = 8; can = 24;
   var c : char;
        pn : integer;
        t : string [1];
         stop : Boolean;
      wr (p, x, y); pn := length (p); s := ''; t := ' ';
      repeat
        read (keyboard, c);
         stop := eoln (keyboard);
         if not stop then begin
            case ord (c) of
               bs : if pn > length (p) then begin
                          pn := pn - 1; wr (' ', pn, y);
delete (s, length (s), 1)
                       end:
               can : begin
                         wr ('', y, y); wr (p, x, y); pn := length (p); s := ''
             if (pn < 40) and not (ord (c) in [bs, can]) then begin
               t [1] := c; s := concat (s, t); wr (t, pn, y); pn := pn + 1
            end
         end;
      until stop
    end;
```

#### Presenting a C Compiler for CP/M-86® and IBM® PC-DOS® That Speaks Your Language!

The C86TM Compiler offers the most up-to-date language available, especially designed for CP/M-86TM. Special features include the Clanguage pre-processor, externals, statics, data initialization, pointers, arrays, structures, longs and floats.

You can't beat the convenience, dependability and affordability of the C86<sup>TM</sup> compiler, and with no assembly step required, it's faster than you ever imagined!

The C86TM system includes a linking loader, librarian and a large support library. All library source code is included, so that you may extend or modify the library. You may combine code written in C with code written using ASM-86TM.

IBM® personal version available soon.

For more information write or call. Dealer inquiries invited.

\$450 Disk and Documentation.

\* 25 Documentation only.

5 20 Overseas Airmail.

Computer Innovations, Inc. 75 Pine Street

Lincroft, New Jersey 07738 Telephone: (201) 530-0995

C86 is a trademark of Computer Innovations, Inc.; CP/M-86 and ASM-86 are trademarks of Digital Research; IBM and PC-DOS are registered trademarks of International Business Machines, Inc.;

#### START YOUR OWN COMPUTER

HOW TO START YOUR OWN SYSTEMS HOUSE 7th edition, November 1981

Written by the founder of a successful systems house, this fact-filled 220-page manual covers virtually all aspects of starting and operating a small systems company. It is abundant with useful, real-life samples: contracts, proposals, agreements and a complete business plan are included in full, and may be used immediately by the reader. Proven, field-tested solutions to the many problems facing small turnkey vendors are presented.

HOW TO BECOME A SUCCESSFUL COMPUTER CONSULTANT

by Leslie Nelson, 4th revised edition, December 1981

Independent consultants are becoming a vitally important factor in the microcomputer field, filling the gap between the computer vendors and commercial/ industrial users. The rewards of the consultant can be high: freedom, more satisfying work and doubled or tripled income. This manual provides comprehensive background information and step-by-step directions for those interested to explore this lucrative field.

#### FREE-LANCE SOFTWARE MARKETING

by B.J. Korites, 3rd edition, June 1980

Writing and selling computer programs as an independent is a business where . you can get started quickly, with little capital investment • you can do it full time or part time • the potential profits are almost limitless. This best-seller by Dr. Korites explains how to do it.

HOW TO START YOUR OWN WORD PROCESSING SERVICE

by Leslie Nelson, February 1982

Turn a small investment into a steady, money making business that adds \$10,000, \$50,000 or \$100,000 to your income. Detailed start-up, marketing and operations plans are included.

Send check, money order, VISA, Master Charge or American Express # and exp. date. Publisher pays 4th class shipping. Add \$1.00 per book for UPS shipping (USA only). NJ residents add 5% sales tax. For faster shipment on credit card orders call (201) 783-6940.

ESSEX PUBLISHING CO. Dept. 2

285 Bloomfield Avenue . Caldwell, N.J. 07006

#### ORDER: 1-800-547-2492 IN OREGON CALL SERVICE: 503-479-4150

SPECIAL ON APPLE REPAIRS - ALL PRICES PLUS PARTS

APPLE II \$50 DRIVES \$40 PRINTERS APPLE III \$100 SILENTYPE \$50 PERIPHERAL CARDS \$45

ATARIプル

**EPSON** OKIDATA 400 (16K) \$325 80 \$389 MX-80 \$439 800 (16K) \$675 MX-80FT \$539 82A \$539 MX-100 83A \$829 \$699 I.D.S. 84 \$1229 \$1049 560G Printer

WORD PROCESSOR PACKAGE - WORDSTAR, 80 Column, w/enhanced character set, Z-80 & 16K Card by ALS \$1049

MAGNUM SYSTEM — OLIVETTI 121 Printer/Typewriter w/RS 232 or Parallel Interface \$1495

SHIPPING: Add 3% of total transaction for UPS brown (ground) or 5% for UPS blue (air), Parcel Post,

or any special arrangements.
PAYMENT: Cashier's checks, certified checks, money orders, and bank wires honored immediately.
Wire transfer funds to U.S. National Bank of Oregon, South Grants Pass Branch. Credit RCE, account number 501-981, Add 3% for Visa and Master Charge. Allow 20 days for personal checks to clear.

REFUNDS: 10% restocking charge on all returns or exchanges. No refunds on opened software. Call first, GUARANTEE: All products with full manufacturer's warranty. Sanyo and Apple warranty available. We have full repair and service facilities for all electronic repairs with HP, Dynascan, Poerer, Sanyo and Apple trained and certified technicians. For any technical service call them for instant advice or questions t on their benches at (503) 479-4150.

right on their benches at (303) 4 (9-4130). REPAIRS: Out of warranty guarantee: Labor 30 days from date of your receipt, 90 days on parts. Call for details on quality guaranteed discount repair and reconditioning service. We have been repairing electronic equipment for 12 years and love it!

"A Unique Combination of Quality Products, Competitive Prices, and Service"

#### APPLE HARDWARE

# MICRO SCI DISK DRIVES (DIRECT APPLE REPLACEMENT) A-2 DISK DRIVE A-70 CONTROLLER – 3.3 & 3.2 CCS 7710A SERIAL INT CCS 7710A SERIAL INT CCS 7710D SERIAL INT VIDEX 80 COLUMN VIDEX ENHANCER II LOWER CASE ADAPTOR 16K RAM CARD MICROSOFT OR MPC MICROSOFT OR MPC ALS Z-80 CARD (MICROSOFT) MICROMODEM (HAYES) SMART MODEM (HAYES) NOVATION MODEMS APPLE CAT AUTO CAT AFFLE CAT ATO CAT D CAT MOUNTAIN CLOCK MOUNTAIN A/D CONVERTER MOUNTAIN A/D CONVERTER MOUNTAIN A/D CONVERTER MOUNTAIN CP S. KBD 23 KEYPAD SUP-R-TERM (80 COLUMN) SUP-R-TERM (80 COLUMN) SUP-R-TERM (80 COLUMN) D STICK (TI-G) RE (SANYO) 12" CATE MONITOR (SANYO) 12" CREEN MONITOR (SANYO) PSON CABLE & INTERFACE PSON CABLE & INTERFACE PSON CAFAFRAX POWERLINE PROTECTOR

#### ATARI HARDWARE

410 PROGRAM RECORDER	\$69
810 DISK DRIVE	\$429
820 PRINTER	\$249
822 PRINTER	\$339
825 PRINTER	\$579
830 MODEM	\$149
850 INTERFACE MODULE	\$155
853 16K MEMORY EXPANSION	\$75

#### SOFTWARE

VISICALC (ATARI)	\$159
BASIC (ATARI)	\$45
VISICALC	\$139
VISIDEX	\$149
VISIPLOT	\$129
VISITERM	\$109
VISITREND/PLOT	\$185
MICROLAB DATA FACTORY	\$129
D B MASTER (STONEWARE)	\$179
SUP-R-TEXT II	5109
WORDSTAR	5349
B.P.I. SOFTWARE (each)	\$315
	\$ 265
ZORK	\$35
SARGON CHESS	529
GALAXIAN	
VERBATIM DISKS	\$29
	\$38
B.P.I. SOFTWARE (each) STOCKFILE INVENTORY ZORK SARGON CHESS	\$31 \$26 \$3 \$2 \$2 \$2

MINIMUM ORDER-\$100.00

MINIMUM SHIPPING CHARGES-\$4.00

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

WRITE FOR CATALOG





RALSTON-CLEARWATERS **ELECTRONICS** 

530 N.E. 'E' Street • Grants Pass, Ore. 97526 ALL BRAND NAMES ARE REGISTERED TRADE MARKS

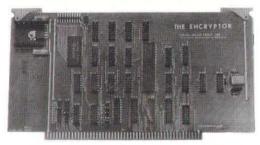
429

# Main/Frames Listing 1 continued: • 30 Models of Enclosures Assembled and tested Quasi-Coax Motherboards Power Supply Card cage and guides Fan, line, cord, fuse, power & reset switches 8" Floppy Main/Frame 8" Disc Enclosure Phase/80 8" Floppy Mainframe Phase/80 Desk + Mainframe Write or call for our brochure which includes our application note: "Building Computers -A Recipe" 8620 Roosevelt Ave. • Visalia, CA 93291 209/733-9288

```
function rdc (p : string; x, y : integer) : char;
var c : char:
begin
 wr (p, x, y); read (keyboard, c); rdc := c
procedure clrdisp;
begin
 wr (**, 0, 3)
end:
procedure boxlines (angle : ortho; x, y, n, p, LineLength : integer);
( Draw n + 1 lines at the angle specified, p pixels apart )
var i : integer; {index}
begin
 if angle = horizontal then turnto (0) else turnto (90); for i := 1 to n do begin
    pencolor (none); moveto (x, y);
pencolor (white); move (LineLength);
    if angle = horizontal then y := y + p else x := x + p
  end ( for )
end; { boxlines }
procedure Drawcharbox (x, y : integer);
( This draws the exploded character box (the "pallet") onto the screen )
begin { Drawcharbox }
  boxlines (horizontal, x, y, 9, 9, 63); (9 horizontal lines 9 pixels apart)
  boxlines (vertical, x, y, 8, 9, 72); (8 vertical lines 9 pixels apart)
end; { Drawcharbox }
function keysense : Boolean;
{ Tell me when the user has pressed a key with the Sup-R-Term board } const clear = -16368; {location to clear keyboard strobe}
      kbd = -16384;
                        {location of keyboard input byte}
  function peek (addr : integer) : integer;
  type word = packed array [0..1] of 0..255;
trix = record
                  case Boolean of
                    false: (ptr: ^word); (pointer to a Pascal word)
true: (int: integer) (its representation)
                end:
  var magic : trix;
  begin
    magic.int := addr; (set up the pointer)
peek := magic.ptr^ [0] (look at what the pointer illuminates)
  end:
begin (keysense)
  keysense := peek (kbd) > 128; {data come in as negative ASCII}
function upcase (c : char) : char:
( Translate the character to upper case )
begin
  if c in ['a'..'z'] then upcase := chr (ord (c) - ord ('a') + ord ('A'))
  else upcase := c
end:
function gc (legal : legalset: prompt : string: echo : Boolean) : char;
{ Read a character from the keyboard until it is legal }
var c : char:
    s : string [1];
begin.
  2 := , ,!
  repeat
    if echo then c := rdc (prompt, 0, 0) else read (keyboard, c);
    c := upcase (c);
  until c in legal;
  qc := c
end:
procedure nextchar (x, y : integer);
( Causes the turtle to move to logical text position (x, y). Top left
 corner is (0, 0). }
begin (nextchar)
  pencolor (none);
  if x < 0 then x := 0 else if x > 22 then x := 22; (set x min and max)
  if y < 0 then y := 0 else if y > 13 then y := 13; {set y min and max} moveto (x \pm xblocksize, ymax - (y + 1) \pm yblocksize + 1)
end; (nextchar)
procedure onbox (c : char);
{ put the turtle at the logical "box" of the character specified }
begin
  nextchar (ord (c) mod CharsPerRow + 3, TopRow + ord (c) div CharsPerRow)
end:
procedure stepchar (c : char);
{ Move the turtle to the next character to be edited }
begin
  onbox (c); turnto (0); move (2); turnto (90); move (2);
procedure drawallchars;
                                                           Listing 1 continued on page 432
```

We accept BankAmericard/Visa and MasterCharge

### **ENCRYPTOR™** THE



### DATA SECURITY

- S-100 COMPUTERS, IEEE-696 DESIGN.

  CP/M\* SOFTHARE ON 8 INCM SINGLE DENSITY DISKETTE AVAILABLE.

  NATIONAL BUREAU OF STANDARDS ENCRYPTION ALGORITHM.

  HIGH SPEED A.M.D. 9518 DATA CIPHENING PROCESSOR.

  1.3 MEGABYTES PER SECOND THROUGHPUT.

  3 ENCRYPTION/DECRYPTION FORMATS.

  OVER 72 QUADRILLION 56 BIT MASTER KEYS.

  PLUG SELECTABLE I/O PORT ADDRESSES AND INTERRUPTS.

  GOLD PLATED FINSERS, CARD EJECTORS AND SOLDER MASK.

  ASSEMBLED, BURNED-IN AND TESTED.

  1 YEAR LIMITED WARRANTY.

  \$425.00 SINGLE QUANTITY.

- 2% CASH DISCOUNT FOR MONEY ORDERS AND C.O.D.\*S.
  MASTERCARD AND VISA CREDIT CARDS ACCEPTED.
  SHIPPING CHARGES AUDED TO ALL ORDERS.
  6% SALES TAX ADDED TO PENNSYLVANIA DESTINATIONS.
  PRICES AND SPECIFICATIONS SUBJECT CHANGE WITHOUT NOTICE.
- DEALER AND D.E.M. INQUIRES INVITED.
- TELEPHONE 215-865-1222
- MUNDAY-FRIDAY, BAM-5PM, EASTERN TIME
- LEHIGH VALLEY LOGIC . INCORPORATED
- 2503 NORTH COURT BETHLEHEM, PENNSYLVANIA 18017 U.S.A.
- CP/M IS A REGISTERED TRADE MARK OF DIGITAL RESEARCH. INC.

### How to buy a screen editor for your IBM Personal Computer:

- 1. Find one of CompuView's full-page ads for VEDIT.
- 2. See if VEDIT can:
  - Simultaneously edit multiple files.
  - Split the screen into as many as 4 windows horizontally, vertically or both.
  - Scroll each window up-and-down and side-to-
  - Move and copy text within and between windows
  - Globally search or replace using regular expression pattern matching.
  - Give you online help when you need it, at the touch of a button.

(EDIX, the world's finest microcomputer text editor, can do all of this and more!)

- 3. Send \$195 to us (instead of to them).
- 4. We'll send EDIX to you.

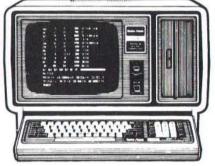
EDIX requires an IBM Personal Computer with 64K and one floppy. Call or write for our detailed brochure.



Emerging Technology Consultants, Inc. Box 154 Louisville, CO 80027

(303) 447-9495

EDIX is a trademark of Emerging Technology Consultants, Inc.



Model II 26-4002

8 Megabyte

### Hard Disk

(Primary) 26-4150.

### DISCOUNT TRS-80® Computers

We have the Largest Inventory in the Central United States. Discount prices on software and accessories for your TRS-80 computer needs.

BUY DIRECT Toll Free Order: 1-800-835-9056

Kansas Residents: 1-800-362-9091

- \* No out of state Taxes
- \* Immediate Shipment
- \* Several Payment Methods
- \* Direct Buying

# Jimscot, Inc.

P.O. Box 607 - 1023 N. Kansas Liberal, Ks. 67901

\* TRS-80 is a Registered Trademark of Tandy Corporation

WRITE TODAY FOR YOUR FREE CATALOG!

431

```
Circle 302 on inquiry card.
              Buy with Confidence
                                           from the best
               COMPUTERS, PRINTERS, TERMINALS
              GREAT PRICES, GREAT SERVICE, GUARANTEED
                Calculators CALL TOLL FREE: 1 800 421-1520
In Calif. 213 320-4772
COMPUTERS & TERMINALS
              CALL TOLL FREE FOR PRICES
                                                                 VIDEO TERMINALS
& MONITORS:
             COMPUTERS:
             Altos
                                                                   ADDS
             Apple
             Atari
                                                                   Amdek
             Commodore
Hewlett-Packard
                                                                   Ampex
                                                                   B.M.C
             BMC
              Intertec/Superbrain
                                                                    Hazeltine
                                                                   I.B.M.
              NEC
                                                                    Lear-Siegler
               Northstar
                                                                    N.E.C
              Onyx
                                                                                                              Only $19.95
              Point Four
Sharp
                                                                   Sanvo
                                                                   Soroc
Televideo
               Televideo
                                                                   Zenith
               Vector
                                                                PRINTERS
                        Capple
                                                                                                            D.C. Haves
                                                                                                                Modems
                                                                                                        at great prices.
                                                            I.D.S./Paper Tiger
              THERMAL
                                                             Microline/Okidata
                                                                                                         We have IBM
               Apple
                                                            MPI
               Trendcom
                                                                                                              software.
                                                             Texas Instruments
              DOT MATRIX
                             Epson 80 Ribbons - $11.50
ACCESSORIES
                                                            LETTER QUALITY
               Anacom
               Anadex
               Commodore
                                                                             Fortran
                                                                                                                   Reg $50 95
Only $45.00
                                                                             Pascal
               80 COLUMN
                                                                             Vanguard AP/L
               VIDEO CARDS
                                                                             OTHER PRODUCTS
               Double Vision
                Smart-Term
                                                                             Bar Code Readers
                                                                             Card Readers
Game Controls
                Videx
               LOWER CASE
                                                                             Graphics Tablet
                ADAPTERS
                                                                              Music System
                Dan Paymar
                                                                              Numeric Keypads
               INTERFACE CARDS
                                                                             Programming Aids
Type-and-Talk
                 Apple
California Computer
                                                                              Video Digitizers
                                                                     The best non-technical
               Mountain Computer
               S.S.M. Products
                Thunderclock
               LANGUAGES
                Basic Compiler
C.I.S. Cobol
                                           PRINTERS - MONITORS
                                                                                                              NEW
                                                                                                                  MX 100 &
                                                                                               MX 80 F/T
                 MONITORS
                                                                                                                    The new 136
                 BMC & NEC Green Screen
                                                                                                            column Epso
                                                                               phinter with graphics and the
Friction tractor MX 80 are in
stock WE HAVE THE GRAPHIC
PACKAGE FOR MX 80 call.
                 NOW IN STOCK
                 FDUCATORS
                 We have the CORVUS
systems to hook up several
                                                                                         SILENTYPE PRINTER
                 Apple computers at once!
                                                                                        ONLY $284.00
                                                                                          Computer furniture too
               NEC & DIABLO PRINTERS
                 Anadex, Pap
Tiger, CALL
                                    ACCESSORIES - SOFTWARE
                for latest prices
                                  Call for catalog.

        Visicalic 3.3
        $159.Reg
        $199

        BPI GL/INV/AR/reach
        299.Reg
        399

        Task Preparer by Howardsoft
        139.Reg
        150
        Bausch8Lon

        Real Estate Analyzer Howardsoft
        125.Reg
        150
        For your corr

        Creature Financing
        Howardsoft
        125.Reg
        150
        Houston inst

        ASCII Express II by SOS
        55/Reg
        55
        CALLI

                                                                                                          Bausch&Lomb plotters
for your computer by
                   MICROSOFT 16K
```

1(800)421-1520 In Cal (213)3204722 304

Mail orders ONLY: NET PROFIT COMPUTERS Visit our retail store. Net Profit Computers 521 W. Chanman Ave Net Profit Comp. 521 W. Chapman Avi Anaheim, Cal. 92802 2908 Oregon Court, Bld G1 Torrance, Ca 90503 1(800)421-1520 in Cal 213 320-4772 Anaheim, Cal 714 750-7318

2% shipping and 3% for charge cards.

```
Listing 1 continued:
```

```
( Crank out the characters in the charset file in a nice format )
var c : char:
   line : integer:
 procedure stepback (ic : integer);
  { Moves the turtle to the specified character and back one pixel }
    onbox (chr (ic)); turnto (-90); move (1); turnto (180); move (1)
  end:
hegin (drawallchars)
  (reset did an initial 'get' for us)
  for c := chr (0) to chr (127) do begin
    stepchar (c):
    drawblock (icfile ford (c)], 1, 0, 0, 7, 8, turtlex, turtley, 10)
  end:
                    {keep it kosher}
  close (icfile):
  stepback ((CharRows - 1) * CharsPerRow); (go to the bottom line)
  boxlines (horizontal, turtlex, turtley, CharRows + 1, yblocksize,
              CharsPerRow * xblocksize);
  stepback ((CharRows - 1) * CharsPerRow); {put the turtle back}
  boxlines (vertical, turtley, turtley, CharsPerRow + 1, xblocksize,
CharRows * yblocksize)
procedure Genchar;
( This procedure does the actual editing )
type cursor = (pallet, menu);
                     (the character for edit)
var c : char;
    x, y : integer; (cursor position)
    bitbox : block; (edit box)
inc : char; (input character)
    stack : array [0..7] of block; {bitbox stack for saving characters}
    sp, ts : integer; {stack pointers}
  procedure clearbits;
   { Initialize the edit parameters }
  var i, j : integer;
  begin
    x := 0; y := 0;
for i := 0 to 7 do for j := 0 to 7 do bitbox [i, j] := 0
  procedure placechar (c : char);
   ( Put the character in the bitbox where it's supposed to go )
  begin (placechar)
     stepchar (c):
     drawblock (bitbox, 2, 0, 0, 7, 8, turtlex, turtley, 10);
   end;
        (placechar)
   procedure putblock (which : color; x, y : integer);
   For a block of the specified color both on the edit screen and
on the current edit character's corresponding position. This
                                                                This also
     changes the contents of bitbox }
   begin
     if (x in [0..6]) and (y in [0..7]) then begin
       bitbox [y, x] := ord (which)
     end
   end;
   procedure newchar;
   ( Finish the edit )
 begin
                  (draw the character as it will appear)
   placechar (c);
   exit (Genchar)
 end:
 procedure clearchar:
 ( Clear the current character )
 var i, j : integer;
               (reinitialize)
   clearbits:
   for i := 0 to 6 do for j := 0 to 7 do putblock (fblack, i, j)
 procedure spraychar (c : char);
 { Put the specified character onto the pallet }
 var i, j : integer;
 begin
   stepchar (c);
   for i := 0 to 6 do for j := 0 to 7 do
     if screenbit (turtlex + i, turtley + j) then putblock (fwhite, i, j)
     else putblock (fblack, i, j)
 procedure flashit (where : cursor; x, y : integer);
 ( flash the cursor at the current edit position )
 var k : Boolean;
```

Listing 1 continued on page 434

## FILL THE GAPS

### IN YOUR SYSTEMS' PERFORMANCE

### INTELLIGENT DATA BUFFER

Applications for:

 Printers, Terminals and **Data Communications** 

### **AUTO SWITCHER**

 Remote Selection of Common Port to One of 4 Destinations

### UTILITY INTERFACE

- Sales Aid
- Instruction Aid
- Demonstration Aid



15074 N.E. 40th St. . Redmond, WA 98052 Order (206) 882-2225

**Dealer Inquiries Welcome** 



### Give Your TRS-80\* a Tremendous Boost with RACET COMPUTES Software

RACET COMPUTES Utility Software makes the TRS faster, more efficient, and easier to use. Our programming aids improve your productivity. Our reputation is for products that are professional in design and work as advertised!!!

### FIELD PROVEN HARD DISK DRIVES AND OPERATING SYSTEM

Now you can use RACET's Hard/Soft Disk Operating System (HSDS) with the ARM Winchester Disk Drive on the Model II. This cost effective combination provides 15 Megabytes per drive including ECC Error Correction Code and an advanced sequencer to further ensure data integrity. An incremental backup to floppy is provided so that only those sectors that were changed from the last backup are saved. A full monthly service contract is available at \$30 per month per drive

The HSDS Software has more than One Year's FIELD Experience. The latest HSDS version adds several enhancements including maintenance of system files on the hard drive, files as large as the disk, the ability to segment the disk as logical drives, definable directory size, and many utilities including bulk copies between floppy and hard drives, multiple purge, Superzap, and Directory Catalog System. Full program compatibility with TRSDOS 2.0a is maintained. Mixed theory and hard drive operation is supported. floppy and hard drive operation is supported.

HSDS is available for the Cameo, Cynthia Bull, Corvus, Data Peripherals, and Santa Clara Systems hard disk systems as well as the ARM Winchester Drive.

ARM 15 Megabyte Drive Subsystem \$3895. Cameo 5/5 Cartridge Drive \$5995. Cyn **HSDS** Software Cynthia Bull 10/10 Drive

### NEW PRODUCT ★ Model II Fast Backup Utility ★ \$75

5 to 10 times faster backups!!! Full disk backup (including verify) 55 seconds!!! on two drive system — 2:15 on single drive system. In business, time is money, and one BACKUP is worth 1000 tears!!

### NEW PRODUCT ★ INTEGRATED BUSINESS SYSTEM ★

ISAM File Structure — Multi-Company Capability. Modular structure. Each module includes complete user documentation which guides the user through installation and allows "practice" using a sample data base. When ready, the user simply names his data base and begins. The Integrated Business System program set includes General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory, General Journal, Asset Management and more.

Business Programs \$250/module Mod III, \$300/module Mod II, \$795 for all four Mod III, \$995 for all four Mod II. General Ledger and Accounts Receivable available now. Accounts Payable and Payroll 1st Quarter 1982



CIRCLE READER RESPONSE BELOW FOR FREE CATALUG
\*TRS-80 IS A REGISTERED TRADEMARK OF TANDY CORPURATION TELEPHONE ORDERS ACCEPTED (714) 997-4950 CIRCLE READER RESPONSE BELOW FOR FREE CATALOG

### GET THE MOST FROM YOUR NEC PC-8001 WITH RACET COMPUTES SOFTWARE!!

**RACET NECDOS \$175** 

RACET NECDOS does more for your PC-8001 than any other DOS. It's faster, more efficient and easier to use. It's loaded with extra features to let you stretch the limits of your system. This advanced operating system works with the ROM NBASIC to give full compatibility with color and other BASIC commands.

USER FRIENDLY — Emphasizes Integrity. No MOUNT or REMOVE commands!!! Excellent protection from improper diskette swapping. AGAIN, HELP, FIND and REF commands. File password protection.

REF commands. File password protection.

ADVANCED DESIGN. RACET NECDOS utilizes the computer in the 8031 for most disk I/O functions minimizing memory utilization in the PC-8001. The Dynamic Transient Area (DTA) allows multiple transients to be scatter loaded and relocated in memory simultaneously. This unique capability optimizes use of valuable memory, yet provides an almost limitless growth potential.

ADVANCED FEATURES. All DOS functions and commands may be used directly in a BASIC program!! Special RUN option allows merging of programs, retaining all variables in memory. Fixed block spanned records. AUTO and DO commands. Machine language loads and saves. MATPRINT and MATINPUT to disk. Complete directory. ALL supervisory calls documented and available to the machine language programmer. Superzao utility included. language programmer. Superzap utility included.

### CONVERT TRS-80\* PROGRAMS TO RACET NECDOS WITH 'PROTRAN' \$99.95

COMPLETE utilities for file transfer and BASIC program conversion. Model III diskettes may be read directly. Model I and II via RS-232. Transfer BASIC programs, data files, or machine language files. NO support is provided for conversion of machine language files on PEK's, POKE's, or USR's to function on PC-8001. Includes Mod I, Mod II and RACET NECDOS Datadisk with complete documentation on conversion requirements and syntax differences.

### MULTI-KEY SORT 'MKS' \$60

SUPER FAST Machine Language In-Memory Sorts. Three-key sort on 500 elements in 4 Seconds!!! Simple one-line BASIC functions — SORTV and SORTC verbs. Mixed ascending and descending keys.

### KFS-80 KEYED FILE SYSTEM \$150

Machine language BASIC ISAM utility provides keyed and sequential access to multiple files. Simple interface to BASIC. Binary tree keyed-file index system provides rapid access to records.

RACET COMPUTES SOftware for the NEC is distributed by the Waybern Corporation and is available from your local NEC Dealer.

### **Waybern Corporation**

13911 Enterprise Dr., Garden Grove, CA 92643 (714) 554-4520 • (213) 222-7514

RACET COMPUTES

CIRCLE READER RESPONSE BELOW FOR FREE CATALOG

Circle 458 on inquiry card.

BYTE May 1982 433

### FOR TRS-80 MODEL I OR III AND SOON FOR THE NEW **IBM PERSONAL COMPUTER!**

★ MORE SPEED

10-20 times faster than Level II BASIC.

\* MORE ROOM

WORLD NOTE TO THE TOTAL MEMORY MAKES YOUR SHOULD NOT THE TOTAL MEMORY MAKES YOUR RAM act larger. Variable number of block buffers, 31-char-unique wordnames use only 4 bytes in header!

\* MORE INSTRUCTIONS

MORE INSTRUCTIONS
Add YOUR commands to its 79-STANDARD-plus instruction set!
Far more complete than most Forths: single & double precision, arrays, string-handling, clock, more

\* MORE EASE MORE EASE Excellent full-screen Editor, structured & modular programming Word search utility THE NOTE/PAD letter writer Optimized for your TRS-80 or IBM with keyboard repeats, upperflower case display driver, full ASCII, single- & double-width graphics, etc.

MORE POWER

MORE POWER
Forth operating system
Interpreter AND compiler
8080 or 8086 Assembler
(280 Assembler also available for TRS-80)
Intermix 35 to 80-track disk drives
Model III and IBM can read, write and run each
other's and Model I diskettes!
VIRTUAL I/O for video and printer, disk and tape
(10-Megabyte hard disk available)



### THE PROFESSIONAL FORTH FOR TRS-80

(Thousands of systems in use)

### AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided MMSFORTH Newsletter MMSP-UH IN Newsietter
Many demo programs aboard
MMSFORTH User Groups
inexpensive upgrades to latest version
inexpensive upgrades to latest version
Programming staff can provide advice, modifications
and custom programs, to fit YOUR needs.

MMSFORTH UTILITIES DISKETTE: includes FLOATING POINT MATH (L.2 BASIC ROM routines plus Complex unmbers, Rectangular-Polar coordinate conversions, Degrees mode, more), plus a full Forth-style 280 ASSEMBLER; plus a powerful CROSS-REFERENCER to 130. Forth words by block and line. All on one diskette (requires MMSFORTH V2.0, 1 drive & 32K RAM) . \$39.95\*

FORTHCOM: communications package provides RS-232 driver, dumb terminal mode, transfer of FORTH blocks, and host mode to operate a remote TRS-80 (requires MMSFORTH V2.0, 1 drive & 32K RAM) .......................\$39.95\*

MMSFORTH GAMES DISKETTE: real-time graphics & board games wisource code. Includes BREAKFORTH, CRASHFORTH, CRYPTOQUOTE, FREEWAY, OTHELLO & TICTACFORTH (requires MMSFORTH V2.0, 1 drive & 32K RAM). \$39.95

Other MMSFORTH products under development

### FORTH BOOKS AVAILABLE

MMSFORTH USERS MANUAL - without Appendices, for STARTING FORTH - best companion to our man-\$15.95\*

THREADED INTERPRETIVE LANGUAGES - advanced, excellent analysis of MMSFORTH-like language, \$18.95\* PROGRAM DESIGN & CONSTRUCTION - intro. to structured programming, good for Forth \$13.95\*

-79 STANDARD MANUAL - official reference to 79-STANDARD word set, etc . .

FORTH SPECIAL ISSUE, BYTE Magazine (Aug. 1980) -we stock this collector's item for Forth users and beginners \$4.00\*

\* - ORDERING INFORMATION: Software prices include manuals and require signing of a non-transferrable single system, single-user license. Describe your Hardware. Add \$2.00 S/H plus \$3.00 per MMSFORTH and \$1.00 per additional book; Mass. orders add 5% tax. Foreign orders add 20%. UPS COD, VISA & M/C accepted; no unpaid purchase orders, please.

Send SASE for free MMSFORTH information. Good dealers sought.

Get MMSFORTH products from your iter dealer o

### MILLER MICROCOMPUTER SERVICES (B5)

61 Lake Shore Road, Natick, MA 01760 (617) 653-6136

```
Listing 1 continued:
```

```
procedure delay (var k : Boolean);
{ insert a delay between flashes }
var i : integer:
begin
  i := 100;
  while (not k) and (i > 0) do begin i := i - 1; k := keysense end;
end:
procedure dopallet;
var original : onebit:
    origscr : Boolean;
  procedure putdot (on : Boolean; x, y : integer);
  ( also flash the corresponding pixel in the edit character )
  var fcolor : color:
  begin
    if on then fcolor := fwhite else fcolor := fblack;
drawblock (filler [fcolor], 1, 0, 0, 1, 1,
turtlex + x, turtley + y, 10)
  end:
begin (dopallet)
  original := bitbox [y, x];
origscr := screenbit (turtlex + x, turtley + y);
  while not k do begin
    putblock (fwhite, x, y); putdot (true, x, y); delay (k);
    putblock (fblack, x, y); putdot (false, x, y); delay (k)
  if original = 1 then putblock (fwhite, x, y)
  else putblock (fblack, x, y);
  putdot (origscr, x, y)
end:
procedure domenu;
var reversed : Boolean;
  procedure xor;
  begin
    drawblock (filler [fwhite], 2 # ((xblocksize + 15) div 16), 0, 0,
                  xblocksize, yblocksize - 1, turtlex, turtley, 6)
  begin (domenu)
    onbox (chr (y * CharsPerRow + x));
    reversed := false;
    while not k do begin
      xor; delay (k); reversed := not reversed;
    end:
    if reversed then xor
  end:
begin (flashit)
  k := false;
  case where of
   pallet : dopallet;
      menu : domenu
  end; (case)
end:
procedure push;
( save the current bitbox on the stack )
  stack [sp] := bitbox;
  sp := (sp + 1) \mod B
end:
procedure pop:
( restore the bitbox from the top of stack )
begin
  sp := sp - 1; if sp = -1 then sp := 7;
  bitbox := stack [sp];
  stepchar (c);
  drawblock (bitbox, 2, 0, 0, 7, 8, turtlex, turtley, 10);
  spraychar (c)
end:
procedure shift:
( shift the character up, down, left, or right )
var x, y : integer;
  procedure shiftup:
  begin
    for y := 7 downto 1 do for x := 0 to 6 do
        bitbox [y, x] := bitbox [y - 1, x];
    for x := 0 to 6 do bitbox [0, x] := 0
  end;
  procedure shiftdown:
  begin
    for y := 0 to 6 do for x := 0 to 6 do
        bitbox [y, x] := bitbox [y + 1, x];
    for x := 0 to 6 do bitbox [7, x] := 0
```

### \$100 EPROM PROGRAMMER/16K MEMORY MODULE



 Programs, copies or verifies the most popular 5 volt EPROMS (2758, 2516, 2716, 2532, & 2732)
 Adjustable 25 volt on board supply,

External programming console - Includes 24-pin ZIF socket
 Sockets also included for up to 8 memory chips (2716/2732 EPROMS or 2K X 8 NMOS Static RAMS)
 Memory addressable in 4K/2K windows
 Memory management - 4 memory chips may be independently enabled/disabled under program control
 8-bit I/O port w/handshake
 Software - CP/M version on 8" disk, PET 2001 (requires S100 adapter) on cassette.

### S100 PROTOTYPE MODULE



 Unique prototype module takes up only one computer slot • Uses low cost W/W posts, and if desired, solder tail sockets.

Wiring & components are on the same side
 Provisions for 3 voltage regulators - 5 volt regulator may be TO-3 or TO-220 case
 Any size integrated circuit on .300, .400, or .600 centers may be used
 Typical configurations - 36 16/14-pin IC's, or 4 40-pin & 28 16/14-pin IC's, or 1 40-pin & 4 24-pin & 14 20-pin & 14 16/14-pin IC's, etc.
 Also has provisions for: toggle switch, trimpot, & 2 50-pin ribbon cable headers
 Power & ground traces to each IC position
 Ample de-coupling provisions.

0	о і	
	$\mathbf{n}$	ES

Prog/Mem Mod \$1	195(kit)\$240(A&T)
EPROMS:2Kx8 (5V)	\$8.00(450NS)**
4Kx8 (5V)	\$16.00 (450NS)**
RAMS 2Kx8 (5V)	\$11.50 (150NS)**
Prototype (Board)	\$35.00

Prototype (Pins)	. \$35/M
Software: CP/M version	
(8" diskette)	\$15.00
PET (specify ROMS)	. \$8.00
Shipping & handling	\$2.00

CALIFORNIA RES. ADD 6% SALES TAX.
PAYMENT: MONEY ORDER OR CHECK (ALLOW 10 DAYS TO CLEAR)
\*\*WITH PURCHASE OF PROGRAMMING BOARD

### SIERRA COMPUTER PRODUCTS

3645 Gold Ridge Trail, Pollock Pines, CA 95726/(916)644-5932



EPISODE is a CP/M® computer with 1.6 M byte of disk storage on dual 51/4 floppies. Its compact design provides a wide range of standalone or network applications including data base sharing.

EPISODE gives you total flexibility. You can add your own CRT and Printer, whatever brand and price range you choose. All the logic including the 64K RAM memory is contained on a single 6" × 8" circuit board ensuring maximum reliability.

\*Supervyz is a trademark of Epic Computer Corporation. CP/M is a trademark of Digital Research. EPISODE includes a unique software system called SUPERVYZ<sup>TM</sup> – a menu based software control system that allows the user to integrate application programs.

Dealer inquiries invited, foreign and domestic.



Epic Computer Corporation 7542 Trade Street San Diego, CA 92121 Tel: 714-695-3560

# S-100 INNOVATORS:

# Control of the state of the sta





### **REMOTE CONTROLLER**—Innovative Features:

- \*Complete 256 address control-not just 16
- \*No ultrasonic link-prevents erractic operation
- \*120,208,240 and 277VAC control—for single & 3 phase operation
- \*Hardware driven-requires minimal software
- \*Complete line of industrial switches available—to 5.5KW

### **REAL TIME CLOCK—Innovative Featuers:**

- \*First to use LSI OKI clock chip
- \*Crystal controlled for .002% accuracy
- \*4 software selectable clock generated interrupts
- \*Full clock and calendar data
- \*Lithium battery backup good for 6000 hours!

### **ENERGY WATTCHER™**—Innovative Features:

- \*First microcomputer based energy monitor
- \*Clip on probes for easy installation
- \*Monitors Real Power, not volt-amps
- \*Peak Power and continuous power readings
- \*Single and 3 phase operation

See your local computer dealer or contact SciTronics directly for more information. Watch for future innovative products from SciTronics Inc., 523 So. Clewell St., P.O. Box 5344, Bethlehem, PA 18015 (215) 868-7220

# Fancy Shmancy

Listing 1 continued:

Elaborate microprocessor development systems cost a lot of money, and they can close off your engineering options by locking you into just one or two kinds of chips. Sound familiar? Well, read on—we've got a better idea.

Use your desktop computer; anything that will run CP/M\* is fine. With our microprocessor cross-assemblers you can produce software for eleven of the most popular chip families, and more are on the way.

In two years on the market, our crossassemblers have gained a reputation for quality, performance, and reliability. Hundreds of industrial R&D labs and several major semiconductor houses have found these products a fast, cost-effective way to develop their microprocessor software. We invite you to join them.

### CP/M CROSS-ASSEMBLERS

Extremely fast absolute assemblers, running under CP/M. Generate object file (Intel hex or Motorola S-record format) and listing from standard assembly language for the target processors listed. Features include comprehensive syntax checking, listing control, nested conditional assembly, and insertion of external source files. All versions listed have been thoroughly field-tested and are available now.

XASM05 ... 6805 XASM09 ... 6809 XASM18 ... 1802 XASM48 ... 8048/41 XASM51 ... 8051 XASM65 ... 6502 XASM68 ... 6800/01 NEW! XASM75 ... NEC 7500 XASMF8 ... F8/3870 NEW! XASMZ8 ... Z8

Assemblers . . . . . . . \$200.00 each except XASM75 . . . . . . \$500.00

XASM400 . . . . COP400

Visa and Mastercard accepted. We ship on 8" single-density and Softcard + 5.25" diskettes. Ask us about other formats. OEM INQUIRIES INVITED.

\*Trademark of Digital Research +Trademark of Microsoft



804 S. STATE ST., DEPT. BY52 DOVER, DEL. 19901 302-734-0151

```
procedure shiftleft;
  for x := 0 to 5 do for y := 0 to 7 do
  bitbox [y, x] := bitbox [y, x + 1];
for y := 0 to 7 do bitbox [y, 6] := 0
end;
procedure shiftright;
   for x := 6 downto 1 do for y := 0 to 7 do
     bitbox [y, x] := bitbox [y, x - 1];
     for y := 0 to 7 do bitbox [y, 0] := 0
   end:
  egin (shift)
wrst ('Shift character', 0, 4);
case gc (['U', 'D', 'L', 'R', '2', '4', '6', '8'], '', false) of
'U', '8' : shiftup;
'D', '2' : shiftdown;
'L', '4' : shiftleft;
'R', '6' : shiftright
end; (case)
begin (shift)
   placechar (c); spraychar (c)
end:
procedure invert:
 { invert the entire character }
 var x, y : integer;
begin
   for y := 0 to 7 do for x := 0 to 6 do
   bitbox [y, x] := 1 - bitbox [y, x];
   placechar (c); spraychar (c)
 end:
 function select : char;
 ( select a character for editing )
 var comm : char:
   clrdisp;
wr ('''.'' accepts', 0, 0);
wr ('Up,Down,Left,Right', 0, 1);
    repeat
       flashit (menu, selx, sely);
       read (keyboard, comm);
       case upcase (comm) of
         we upcase (comm) of 'U', '8': if sely - 1 in [O..CharRows - 1] then sely := sely - 1; 'D', '2': if sely + 1 in [O..CharRows - 1] then sely := sely + 1; 'L', '4': if selx - 1 in [O..CharsPerRow - 1] then selx := selx - 1; 'R', '6': if selx + 1 in [O..CharsPerRow - 1] then selx := selx + 1;
           .', '5' : begin
                            select := chr (sely * CharsPerRow + selx);
                            exit (select)
       end; (case)
    until HellFreezesOver
 end:
 procedure getchar:
 { Duplicate another character for editing }
       sc : char;
    wrst ('Get character', 0, 4);
sc := select; (select the character)
                            (push the old character)
    push:
    spraychar (sc); (put the new character onto the pallet)
    placechar (c)
                            (put it into the edit position)
 end:
 procedúre PromptState;
    wrst ('Edit character', 0, 4);
    stepchar (c)
 procedure PromptEdit;
 begin
    clrdisp; .
       wr ('New,Clear,Pop,Invert,Get', 0, 0);
wr ('IShiftl Up,Down,Left,Right', 0, 1);
wr ('''.'' (set),'' '' (clear)', 0, 2);
       PromptState
    end;
    procedure setup:
       clearbits;
                       sp := 0;
       spraychar (c); (put the selected character onto the for ts := 0 to 7 do push; (fill stack with original character)
                                              (put the selected character onto the pallet)
       PromptEdit
 begin { Genchar }
    wrst ('Select character for edit', 0, 4);
    c := select; (select character for edit)
                                                                            Listing 1 continued on page 438
```

### **MODEM HEADQUARTERS**

Connect any computer or terminal to the phone lines! 1200 Baud — 120 Characters per Second

Penril 300/1200 . . . Bell 212A identical. Full duplex, RS232. 1200 and 300 Baud. Originate/auto-answer. Phone connection via RJ11C standard phone jack. One year warranty. Self-test. Fits under phone.

Allows any computer to automatically dial out through the Penril 300/1200.

300 Baud - 30 Characters per Second

Phone Link Acoustic Modem ..... Originate and Answer. Half/Full duplex. RS232. Operates with any standard telephone. Indicators for On, Carrier, Self-test, Send Data, Receive Data. One year warranty.

Originate/Auto-Answer, Half/Full duplex. RS232. Phone connection via RJ11C standard phone jack. Indicators for On, Carrier Detect, Self-test, Send Data, Receive Data. Two year warranty. Fits under phone.

ADDS Viewpoint CRT ..... \$529 150 CPS. 300/1200 Baud. GE2030 Printing Terminal . . . . . . . . . . . . . . . . . . \$999

All equipment is in stock. Your satisfaction guaranteed. Any product may be returned for full credit. Write or call for full product information.



60 CPS. 300/1200 Baud.

U.S. ROBOTICS INC.

203 N. WABASH SUITE 1718 CHICAGO, ILL 60601

(312) 346-5650

### CATCH THE S-100 INC. BUS!



 ${f 2}$  odds & ends

Mullen TB-4 Extender card	LIST PRICE	OUR Special Cash Price
w/logic probe - kit	59.00	49.00
Shugart SA801		100000
bare drive 8"		399.00
3M Scotch 740-0 8"		112/00/1000
diskettes — 10 box		26.00
SSM I/O-4 2P+2S Ports Kit	210.00	168.00
Morrow Designs 8 Slot		
Motherboard A&T	124.00	93.00
Hayes Computer "Stack"		
Smart Modem A&T	279.00	237.00
All S.D. Systems Kits		
(call for available items)	30%	0FF
the contract of the contract o		

Subject to Available Quantities . Prices Quoted Include Cash Discounts. Shipping & Insurance Extra.

> We carry all major lines such as S.D. Systems, Cromemco, Ithaca Intersystems, North Star, Sanyo, ECT. TEI, Godbout, Thinker Toys, SSM. For a special cash price, telephone us.

### 5-100, inc.

14425 North 79th Street, Suite B Scottsdale, Arizona 85260 SALES 800-528-3138 • TECHNICAL 602-991-7870

database

68BUG

### Best Price • Good Quality • Swift Delivery • Export SOFTWARE MONITOR

# COMPUTER LNW 80 Graphic Computer I 48K . . . . . . . . 1,400 II CP/M . . . . . . . 2,300

CROMEMCO	26% off Sys- tem & software
•	15% off boards
001	& components
CS1	5 ¼ " Floppy 2,956
Z2H	hard disk system 7,396
CS3	64K, 8"5,916
Zenith	Z 90-80 new,
	64K 2,290
	Z 90-82 64K,
	1 SS, DD 2,490
	Z 89 48K,
	1 floppy2,095
SWTPC	S/09 128K,
	6809 3,450
	69/K kit, 6809,
	8K 660
	68/09 48K.
	6809 1,500
	/09 64K 1,835
ATARI	400 16K340
276.675	800 16K
NORTH STAR	HORIZON, 2
	quad drive, 64K3,200
	ADVANTAGE, 2
	guad drive, 64K 3,100
TI	99/4 16-bit
DYNABYTE	5200 64K.
Dillandille	1 MB3,300
	5615 64K.
	11 MB hard disk 8,000
TERAK	8510A Graphic,
TENAN	320×240, DD8,000
	8600 Graphic,
	640×480.
	Color, DD 17,000
XEROX 820	1 5 %
AERUA 820	II 8"
	The second secon
NEC	CP/M, 32K799
DEC, ADDs, AL	TOS\$CALL

CROMEMCO	26% off Sys-	NEC
•	tem & software	232/013
	15% off boards	SANYO
	& components	
CS1	5 ¼ " Floppy 2,956	
Z2H	hard disk system 7,396	
CS3	64K, 8"5,916	
Zenith	Z 90-80 new,	
	64K 2,290	ì
	Z 90-82 64K,	(G
	1 SS, DD 2,490	10
	Z 89 48K,	Integral Data S
	1 floppy2,095	PRISM 80
SWTPC	S/09 128K	
	6809 3,450	
	69/K kit. 6809.	PRISM 132
	8K 660	10.024544621242455
	68/09 48K,	MALIBU
	6809 1,500	170PALESTONY IN
	/09 64K 1,835	PRINTEK
ATARI	400 16K340	
	800 16K695	
NORTH STAR	HORIZON, 2	4000000
	quad drive, 64K 3,200	EPSON
	ADVANTAGE, 2	
	quad drive, 64K3,100	
Ti	99/4 16-bit 399	ZENITH
DYNABYTE	5200 64K,	500 ACCESS
Total Control	1 MB3,300	C.ITOH
	5615 64K,	
	11 MB hard disk8,000	
TERAK	8510A Graphic	
	320 × 240, DD 8,000	
	8600 Graphic,	DATA SOUTH
	640×480,	Printer Cable
	Color, DD 17,000	
XEROX 820	15%"2,399	
	II 8"	
NEC	CP/M, 32K799	
NEC	CP/M, 32K	

	TERMINAL
ZENTEC	Z 19
	HAZELTINE \$CALL

ZENITH	ZVM121 12"
	B/W
NEC	12" green
	12" color
SANYO	13" color 44!
	RGB monitor

PRINTER

	w/graphic feature)
Integral Data Sys	
PRISM 80	150 cps
	84×84 G
	color G
PRISM 132	14.5"1,050
	color G
MALIBU	200 letter quality/
party commence.	165 cps G 2,380
PRINTEK	910 144×144.
3.3400.0000	200 cps G \$CALL
	920 144×144,
	340 cps G \$CALL
EPSON	MX70 G 305
	MX80 4
	MX100 735
ZENITH	Z25 150 cps 1,250
EL MITT	
C.ITOH	WH14 75 cps400 Starwriter
C.ITOH	
	40c serial 1,350
	45c parallel 1,550
	25c Serial 1,450
2020122020	COMET 1
DATA SOUTH	DS 1801,299
Printer Cable	below \$ 30

### DIGITIZER/PLOTTER HOUSTON INSTRUMENT HI PAD DIGITIZER DT-11 11" ×11" . . . . . 725 4,000

GDWOE II W	snton-Tate.			4000	0/0
CONDOR I					250
11.					450
m.					850
financial	(AR, AP, In	ventory	etc.	1	
Accounting P	lus				450
Peachtree					500
other					
VISICALC					150
MICROSOFT					
	FORTRAN 8 BASIC 80.	80			345
	BASIC 80.				285
	BASIC Con	npiler.			310
CHIDEDCALC	Casalan				DEO

MAIL MERG

COMPUTER SYSTEM & TECHNOLOGY, INC. Z80ASEM Z80 Macro Assembler 130 

CP/M 2.2 Digital Research . . . . . . . . .

**DISK DRIVES** Micropolis, Tandon.....\$CALL

6800 Debugger & board.

Prices subject to change, Visa/Mastercard add 3%. F.O.B. point of shipment. 20% restocking fee for returned merchandise. Personal checks take 3 weeks to clear. COD on certified check only, N.Y. residents add sales tax.

CALL (212) 937-6363 free consultation, catalogue

CABLE: COMSYSTEC NEW YORK TELEX: 429418 CSTNY 21-55 44th Road L.I.C., NY 11101

437

105

130

# XXXX Ada™ Now

# 68000

XAVAX One/32KB

\$1,500

68000 8MHz single board computer
 Multibus™/IEEE 796 compatible

• 2 RS232C, 2 parallel ports

Sockets for 64KB ROM

• Motorola KDM module compatible 128KB RAM on board, add....(\$500) Manual of boards, chips......(\$15)

XAVAX Two

\$8,50

68000 8MHz Multibus™ computer
256KB RAM expandible to 1MB

• 10MB Winchester, 960KB floppy

One parallel, 2 RS232C ports
 Crapping display manitor

Graphics display monitor
 Multitasking operating sys

Multitasking operating system
 Editor files linker utilities

Editor, filer, linker, utilities
 Language: (Passal C. COF)

 Language: (Pascal, C, COBOL, FORTRAN, BASIC, or Assembler)
 UNIX/7 and APL are options

• UNIX/7 and APL are options.

Manual with OS summary .... (\$15)

Operating system manual .... (\$25)

System manuals set [7] ..... (\$85)

XAVAX Two/3

\$10,850

• Multibus M/IEEE 796 bus, 3 users

• /6 includes 512KB RAM, 6 users

• /6 adds 3 RS232C ports [5 total] XAVAX Two/6 \$12,850

**XAVAX Three** 

\$12,850

XAVAX Two features, plus:

Second 68000 processor

 Memory management on board Ada™ and Pascal with OS . . . (\$5000) Initial XAVAX Two/3, add . . . (\$2350) Initial XAVAX Two/6, add . . . (\$4350)

XAVAX 10 Cartridge Backup \$5,000

• 10MB high speed mini-Winchester

• 7MB integrated backup [3 min.]

Multibus<sup>™</sup> controller [32KB RAM]
 960KB floppy [in main cabinet]

Interface to XAVAX Two, Three.

HARDWARE [Multibus™]

HARDWARE [Multibus™] 880 Kilobaud I/O controller

\$1,500

8 channel RS232C

· Bisync and ASCII asynchronous

· CRC generate, detect, check

ports individually programmable
 channel RS232C I/O board \$300
 channel intelligent RS232C \$580

4 channel parallel board \$400 ANSI Winchester controller \$500 512KB BAM (parity, 270ns) \$1,700

512KB RAM [parity, 270ns] \$1,700 256KB RAM [half populated] \$1,500

SOFTWARE

BizBooks™ [80 modules] \$4,500 • Accounting, inventory control BizGraf™ [8 colors] \$2,500

Business color graphs, plots.

MasterCard and VISA accepted. Ask your distributor for XAVAX.

™ UNIX trademark of Bell Laboratories.

™ Multibus trademark of Intel Corporation.

<sup>™</sup> Ada trademark Department of Defense.

(319) 344-0550

### XAVAX CORPORATION

300 Northwest Tower Bettendorf, IA 52722

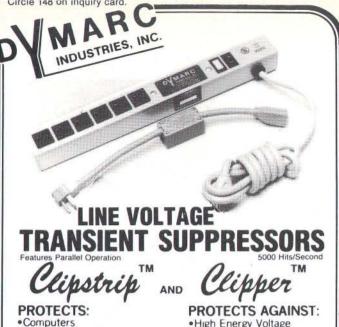
TWX: 910 - 525-1177

XAVAXCORP

Cable:

```
Listing 1 continued:
```

setup; (set up the pallet) repeat flashit (pallet, x, y); (flash the cursor at the current position) read (keyboard, inc); {read the character just typed} case upcase (inc) of (convert to upper case and select action) 'N' : newchar: (accept and exit) 'C' : begin push; clearchar end; (clear pallet) 'U', '8' : if y + 1 in [0..7] then y := y + 1; 'D', '2' : if y - 1 in [0..7] then y := y - 1; 'L', '4' : if x - 1 in [0..6] then x := x - 1; (move cursor up)
{move cursor down} (move cursor left) 'R', '6' : if x + 1 in [0..6] then x := x + 1; (move cursor right) 'P' : pop; (pop char from stack) 'S' : begin shift; PromptState end; (shift char) 'I' : invert; (invert char) 'G' : begin getchar; PromptEdit end; (retrieve another char) '.', '5' : putblock (fwhite, x, y);
'', '0' : putblock (fblack, x, y) (white space) (black space) end; (case) until HellFreezesOver end; { Genchar } procedure gather;  $\langle$  get all the edited characters into their output configurations  $\rangle$ const msg = 'writing out'; var i, x, y : integer; cval : charimage; bitshift : array [0..6] of integer; dotcount : integer; procedure writedot (i : integer): begin if i mod CharsPerRow = 0 then begin wr ('.', length (msg) + dotcount, 0); dotcount := dotcount + 1 end end: begin wr ('', 0, 3); wr (msg, 0, 0); bitshift [0] := 1; bitshift [1] := 2; bitshift [2] := 4; bitshift [3] := 8; bitshift [4] := 16; bitshift [5] := 32; bitshift [6] := 64; dotcount := 0; for i := 0 to 127 do begin stepchar (chr (i)); for y := 0 to 7 do begin cval [y] := 0; for x := 0 to 6 do if screenbit (turtlex + x, turtley + y) then cval [y] := cval [y] + bitshift [x]; end: (for) cfile^ [i] := cval; writedot (i) end (for) end: procedure getfiles: { Get input and output file names and open them } var sysio : integer; begin repeat speat.
wr ('', 0, 0); rd ('Input file: ', 0, 0, filename);
if length (filename) = 0 then exit (program); (\$I-) reset (icfile, filename); (\$I+) sysio := ioresult; if sysio <> 0 then wr (concat ('?Cannot open ', filename), 0, 1); until sysio = 0; repeat peat
wr ('', 1, 1); rd ('Output file: ', 0, 1, filename);
if length (filename) = 0 then exit (program); (\$I-) rewrite (cfile, filename); {\$I+} sysio := ioresult; if sysio <> 0 then wr (concat ('?Cannot open ', filename), 0, 2); until sysio = 0; end: procedure initialize: begin Initturtle: fillscreen (black); fillchar (filler [fwhite], sizeof (cblock), 255); fillchar (filler [fblack], sizeof (cblock), 0); getfiles; fillscreen (black); drawcharbox (xboxcorner, yboxcorner); drawallchars; selx := 0; sely := 0; {initialize character selection coordinates} procedure shutdown; { Get the edited characters and output the charset file } begin gather; put (cfile); close (cfile, lock); clrdisp; wr (concat ('[', filename, ' made]'), 0, 1); if gc (['Y', 'N'], 'new edit? ', true) = 'N' then exit (program);



- Micro-Computer Systems
- Word Processors
- Cash Registers
- Power Supplies

INDUSTRIES, INC.

DEALER INQUIRIES INVITED

(301) 298-3130

· High Energy Voltage Transients

On-Off Switching

Lightning Induced Transients

Inrush of On/Off Power

Clipstrip 977E

LISTED LISTED

7133 Rutherford Rd. Baltimore, Md. 21207 800-638-9098

# **Computer Based** PROM **Programming**

Interface your S-100 Bus Computer with our PPS-100 MULTI-PROM Programmer.

- Disk storage of data/ no master PROMS required
- Clear English commands
- Programs up to 8 EPROMS simultaneously-each with different data
- \$1500

TIGARD, OR. 97223

(503-620-2722)



# What's Good for the Space Shuttle is good for your Apple II! . . .

**MICROWARE** creator of OS-9/BASIC Ø9 (used by N.A.S.A., and leading Universities, government agencies, and corporations Worldwide) joins with STELLATION TWO to deliver the same Operating system and Programming Language to the APPLE II.

OS-9/BASIC Ø9 are the result of a 3 year research project-designed with the 6809 in mind. This "Operators dream machine" combines with THE MILL microprocessor board to provide Apple II users with software features previously reserved for Mainframes and mini's.

JUST PLUG IN THE MILL AND LET BASIC \$\tilde{9}\$ WORK FOR YOU! other Stellation Two products include:

Spooler: Allows Apple II to print while processing Pascal Speedup: THE MILL with software for a 50% faster Apple with



The Lobero Building P.O. Box 2342 Santa Barbara, Ca, 93120 (805) 966-1140 TELEX 658439



MICROWARE.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# MTI stocks 'em all for faster delivery.

### Ask about our "QED" discounts. VISA and MasterCard orders accepted.

VIDEO TERMINALS	
	MTI Price
VT100 DECscope \$	1595
VT 18X Computing option	2400
VT101 DECscope	1215
VT131 DECscope	1785
VT132 DECscope	1995
4 DM 24 /down beauting!	
ADM 3A (dumb terminal)	595
ADM 5 (dumb with visual attributes) .	645
ADM 31 (two page buffer)	1095
ADM 21, 24, 32, 36, 42	*
Hazeltine Esprit	645
Hazeltine Executive 80 Model 20	1495
Hazeltine Executive 80 Model 30	1715
1410 (Hazeltine dumb terminal)	575
1421 (Consul 580 & ADM 3A comp.).	595
1500 (dumb terminal)	825
1520 (buffered, printer port)	1105
RETRO-GRAPHICS TERMIN	ALS
VT 100 with graphics pkg	3250
VT125 (DEC graphics)	3280
ADM 3A with graphics pkg	1795
ADM 5 with graphics pkg.	1845
300 BAUD TELEPRINTERS	
LA 34-DA DECwriter IV	1045
LA 34-DA DECwriter IVLA 34-AA DECwriter IV	1095
LA 36 DECwriter II	1095
Diablo 630 RO	2295
Diablo 630 KSR	2695
Diable 1650 KCD	2000
Diablo 1650 KSR	2635
TI 743 (portable)	1190
TI 745 (port/built-in coupler)	1485
TI 765 (port/bubble/b.i. coupler)	2595
600 BAUD TELEPRINTERS	
Epson MX-80	645
TI 825 KSR impact	1570
TI 825 KSR pkg	1795
1200 BAUD TELEPRINTER	S
Epson MX-100	. 995
LA 120 BA (receive only)	2095
LA 120 RA (receive only) LA 120 AA DECwriter III	2295
TI 702 (and becwriter III	2295
TI 783 (portable)	
TI 785 (port/built-in coupler)	2270
TI 787 (port/internal modem)	2595
TI 810 RO impact	1545
TI 810 RO pkg	1795
TI 820 RO impact	1850
TI 820 RO pkg	2025
TI 820 KSR impact	2025
TI 820 KSR pkg	2195
Lear Siegler 310 ballistic	
	1340
2400 BAUD	
Dataproducts M200 (2400 baud)	
Dataproducts M200 (2400 baud) DATAPRODUCTS LINE PRIN	TERS
Dataproducts M200 (2400 baud) DATAPRODUCTS LINE PRIN B300 (300 LPM band)	TERS 5455
Dataproducts M200 (2400 baud) DATAPRODUCTS LINE PRIN B300 (300 LPM band) B600 (600 LPM band)	5455 6930
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band)	5455 6930 11330
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band) BP1500 (1500 LPM band)	5455 6930
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band)	5455 6930 11330
Dataproducts M200 (2400 baud) DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band) BP1500 (1500 LPM band) ACOUSTIC COUPLERS	5455 6930 11330 19700
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band) B1000 (1500 LPM band) ACOUSTIC COUPLERS A/J A242-A (300 baud orig.)	5455 6930 11330 19700
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band) B1500 (1500 LPM band) ACOUSTIC COUPLERS A/J A242-A (300 baud orig.)	5455 6930 11330 19700 242 315
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band)  ACOUSTIC COUPLERS  A/J A242-A (300 baud orig.)  A/J 247 (300 baud orig.)  Vadic VA 3413 (300/1200 orig.)  Vadic VA 3434 (1200 baud orig.)	5455 6930 11330 19700 242 315
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band)  ACOUSTIC COUPLERS A/J A242-A (300 baud orig.) A/J 247 (300 baud orig.) Vadic VA 3434 (1200 baud orig.)  MODEMS	5455 6930 11330 19700 242 315 845 845
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band)  ACOUSTIC COUPLERS  A/J A242-A (300 baud orig.)  A/J 247 (300 baud orig.)  Vadic VA 3413 (300/1200 orig.)  Vadic VA 3434 (1200 baud orig.)	5455 6930 11330 19700 242 315 845 845
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845
Dataproducts M200 (2400 baud)  DATAPRODUCTS LINE PRIN' B300 (300 LPM band) B600 (600 LPM band) B1000 (1000 LPM band)  ACOUSTIC COUPLERS A/J A242-A (300 baud orig.) A/J 247 (300 baud orig.) A/J 247 (300 baud orig.) Wadic VA 3413 (300/1200 orig.) Wadic VA 3434 (1200 baud orig.)  MODEMS GDC 103A3 (300 baud Bell) GDC 202S/T (1200 baud Bell) WA 3212 (Bell 212A comp.)	5455 6930 11330 19700 242 315 845 845 395 565 825
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 395 566 825 235
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 395 566 825 235 885
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 395 565 825 235 885 770
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 395 5665 825 235 885 770 725
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 845 395 566 825 235 885 770 725 MS
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 395 5665 825 235 885 770 725
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 845 395 566 825 235 885 770 725 MS
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 2422 315 845 845 566 825 235 885 770 725 MS
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 2422 315 845 845 566 825 235 885 770 725 MS
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 242 315 845 845 845 395 566 825 235 885 770 725 MS
Dataproducts M200 (2400 baud)	5455 6930 11330 11330 19700 242 315 845 845 395 565 825 235 825 235 885 770 725 MS
Dataproducts M200 (2400 baud)	5455 6930 11330 19700 2422 315 845 845 566 825 235 885 770 725 MS



Distributors, New York, New Jersey and Ohio.

New York:

516/482-3500, 212/895-7177, 518/449-5959 Outside N.Y.S.: 800/645-8016

New Jersey: 201/227-5552 Ohio: 216/464-6688 Listing 1 continued:

initialize

Text continued from page 426:

move the cursor about within the menu. In the first method, you type the letters U, D, L, and R (for up, down, left, and right, respectively). In the second method, you use a standard numeric keypad (not normally present on the Apple) by pressing the number corresponding to the direction of desired cursor movement (i.e., 2 = down, 4 = left, 6 = right, 8 = up). When the cursor is placed over the character that you wish to edit, press the period key or 5. The character is displayed on the editing pallet and the list of edit options appears.

### Character Editing

A new cursor appears in the lower left-hand corner of the editing pallet.

As with character selection, the cursor is moved about within the pallet with the letters U, D, L, and R, or with the digits on the keypad. The latter method is somewhat easier to use. However, if your Apple is like mine, you will have to suffer use of the directional mnemonics.

In order to make a white block, the period key or 5 is pressed. To make a black block, the space bar or 0 is pressed. If you are observant, you may have noticed by now that all cursor movement and flashing are duplicated by a one-pixel cursor within the menu box of the selected character. In fact, any action taken in the pallet is duplicated to scale within the selected character.

But there is more to it than that. Typing C clears the pallet, giving you

Prompt	Options
ABORT,QUIT,MAKE CHARACTER:	<ul> <li>A = abort; do not save editing done</li> <li>Q = quit; save editing done</li> <li>M = select and edit a character</li> </ul>
'.' ACCEPTS UP,DOWN,LEFT,RIGHT	"." (or 5) = select character U (or 8) = move cursor up D (or 2) = move cursor down L (or 4) = move cursor left R (or 6) = move cursor right
NEW,CLEAR,POP,INVERT,GET [Shift] UP,DOWN,LEFT,RIGHT '.' (SET), ' ' (CLEAR)	N = new character; terminate edit C = clear pallet P = pop character from stack I = invert pallet G = get and copy alternate character S = shift character (up, down, left, right) U (or 8) = move cursor up D (or 2) = move cursor down L (or 4) = move cursor left R (or 6) = move cursor right "." (or 5) = set current pixel "" (or 0) = clear current pixel

**Table 1:** A summary of commands for the CHEDIT program.



**New, Unique Products** Alternate Energy, Telescopes, Optics, Weather, Magnets, Microscopes & More! In One Giant FREE Catalog

Biggest Catalog!

Finest Quality! Since 1941, thousands of engineers, craftsmen & hobbyists nationwide have been coming directly to the Edmund Scientific Catalog for quality products. . .fully guaranteed!

FREE! Simply fill in below, mail today, and your Edmund Scientific Catalog will be on its way to you.

☐ Send FREE Catalog

Name \_

Address

State

Zip



**Edmund Scientific** 

Dept. 8211 KH10 Edscorp Bldg. Barrington, N.J. 08007

No. 3484 °1982 Edmund Scientific Co.

PRODUCTS FOR YOUR RADIO SHACK

Now you can use your printer with your modem! Your computer can be an intelligent printing terminal. Talk to timeshare services or to other personal computers; print simultaneously through a second printer port; and re-display text stored in memory. Download text to Basic programs; dump to a cassette tape, or printer, or both. Microtext can be used with any printer or no printer at all. It features user-configurable duplex/parity for special applications, and can send any ASCII character. You'll find many uses for this general purpose module! Available in ROMPACK, ready-to-use, for \$59.95.

### SOFTWARE DEVELOPMENT SYSTEM

The Micro Works Software Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for your program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor features finds, changes, moves, copys and much more. All keys have convenient auto repeat (typamatic), and since no line numbers are required, the full width of the screen may be used to generate well commented code

The Assembler features **all** of the following: complete 6809 instruction set; complete 6800 set supported for cross-assembly; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile ABUG monitor is a compact version of CBUG, tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. **SDS80C** 





Star Blaster — Blast your way through an asteroid field in this action-packed Hi-Res graphics game! Available in ROMPACK; requires 16K. Price: \$39.95 Pac Attack — Try your hand at this challenging game by Computerware, with fantastic graphics, sound and action! Cassette requires 16K. Price: \$24.95

Berserk — Have fun zapping robots with this Hi-Res game by Mark Data Products. Cassette requires 16K. Price: \$24.95

Adventure - Black Sanctum and Calixto Island by Mark Data Products. Each cassette requires 16K. Price: \$19.95 each.

ROMLESS PAK I — is an empty program pack capable of holding two 2716 or 2732 EPROMs, allowing you up to 8K of program! The PC board inside comes with sockets installed, ready to go with the addition of your custom EPROMs. Price: \$24.95

2-PASS DISASSEMBLER — with documentation package, 16K; cassette, 80C Disassembler Price: \$49.95

CBUG — Machine language monitor. CBUG Cassette Price: \$29.95 CBUG ON 2716 EPROM: Can plug into Romless Pak I. CBUG ROM Price: \$39.95

PARALLEL PRINTER INTERFACE — serial to parallel converter allows use of all standard parallel printers. PI80C Price: \$69.95

Assembly Language Programming, by Lance Leventhal. Price: \$16.95
MEMORY UPGRADE KITS: 4-16K Kit Price \$39.95. 16-32K (requires soldering experience) Price: \$39.95

PARTS & SERVICES: SAMs, 6809Es, RAMs, PIAs, Call for prices.

WE SHIP FROM STOCK!

Master Charge/Visa and COD Accepted

**GOOD STUFF!** 

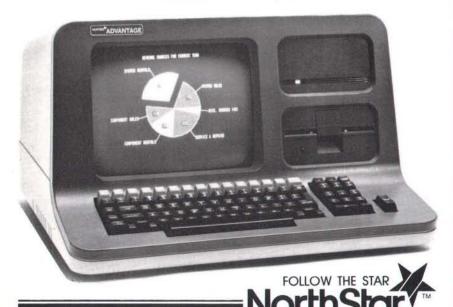
P.O. BOX 1110 DEL MAR. CA 92014 714-942-2400

# North Star's Advantage Over IBM and Apple is easy to see.

The North Star ADVANTAGE desktop computer has higher precision graphics, better software, and greater disk capacity than the IBM Personal Computer or the Apple III. Plus, nationwide on-site service and free business graphics software. See it for yourself. Then check the price. You'll see how easy it is to own the North Star ADVANTAGE. For the name of the North Star dealer nearest you, call today.

1-800-447-4700

(ILLINOIS 1.800.322.4400)



14440 Catalina Street, San Leandro, California 94577

the proverbial clean slate. If you have done this by accident, don't panic; the character is not lost forever. While in edit mode (as opposed to initial character selection mode), the character is saved in an 8-level circular stack. To recover the original character, type P (for pop). Upon entry to edit mode, the stack is filled with the original character found. Therefore, subsequent pops will only vield the same character. However, no mechanism yet exists for recovering from an accidental pop. Thus, this should be used as a "restart edit" command, rather than as a method of comparing or saving succeeding edits. Commands that "push" characters onto the stack are Clear (C) and Get (G). The number of pushes is finite: only the eight most recently cleared characters are saved.

If you wish to obtain another character for editing that might be similar in form or dimension to the one you have in mind, the Get command copies a specified character into the character currently under consideration. As previously mentioned, this operation performs a push of the old character. To perform a Get, typing G places you into a characterselection mode that is used in the same way as the initial selection. The letters U, D, L, and R are used to move the cursor about within the menu: the period is used to select the character under the cursor. A copy of the character specified then appears in the pallet and within the menu box of the character currently being edited.

A Shift mode allows you to move a character about within the pallet. Although pixels shifted off the edges of the pallet are lost and cannot be recovered, the entire original character may be recovered with the pop command mentioned earlier. To shift the character, press S followed by the direction of the shift (U, D, L, or R). Since only one shift is performed, subsequent shifts require S to be pressed again before specifying the direction.

Finally, an Invert command causes all black pixels to become white and vice versa. This is done by pressing I.



## TRS-80's™ and **Hewlett-Packards**

### **Best Discounts Possible**

WE PAY SHIPPING in the 48 continental states on prepaid orders of \$100.00 or more.

NO TAXES are collected on out-of-state shipments.

WE ACCEPT Visa, MasterCard and American Express, or you can save additional money by paying cash.

TOLL FREE ORDER NUMBER 800/531-7466

# Pan American Electronics

1117 Conway . Dept. 16 Mission, Texas 78572 Phone 512/581-2766 Telex Number 767339

FORT WORTH BRANCH

2912 N. Main Ft. Worth, Texas 76106 Phone 817/625-6333 Telex Number 794836

- Trademark of Tandy Corporation



### TERMINALS FROM TRANSNET

Onchase Flan - 12-2-	4 MONTH FULL OWNERSHIP PL  DESCRIPTION	PURCHASE		ER MONTH	
DEC	LA36 DECwriter II LA34 DECwriter IV LA34 DECwriter IV Forms Ctrl. LA320 DECwriter III KSR LA120 DECwriter III RO WT100 CRT DECscope WT101 CRT DECscope WT135 CRT DECscope WT135 CRT DECscope WT135 CRT DECscope WT132 CRT DECscope WT132 CRT DECscope WT132 CRT DECscope	\$1,095 995 1,095 2,295 2,095 1,695 1,195 3,295 1,745 1,995	\$105 95 105 220 200 162 115 315 167 190 230	\$ 58 53 58 122 112 90 67 185 98 106 128	\$ 40 36 40 83 75 61 43 119 63 72 86
TEXAS INSTRUMENTS	T1745 Portable Terminal T1765 Bubble Memory Terminal T1 Insight 10 Terminal T1785 Portable KSR, 120 CPS T1787 Portable KSR, 120 CPS T1810 RO Printer T1820 KSR Printer	2,595 695 2,395 2,845 1,695	153 249 67 230 273 162 211	85 138 37 128 152 90 117	58 93 25 86 102 61 80
LEAR SIEGLER	ADM3A CRT Terminal ADM5 CRT Terminal ADM32 CRT Terminal ADM42 CRT Terminal	1,165	57 62 112 190	34 36 65 106	22 24 42 72
DATAMEDIA	EXCEL 12 CRT Terminal EXCEL 42 Smart Buffered CRT COLORSCAN 10 Color CRT	1,695 995 3,195	162 96 307	90 54 171	61 36 116
TELEVIDEO	925 CRT Terminal	850 1,075	82 103	46 57	31 39
NEC SPINWRITER	Letter Quality, 7715 RO Letter Quality, 7725 KSR	2,895 3,295	278 316	154 175	104
ENERAL ELECTRIC	2030 KSR Printer 30 CPS	1,195 2,195	115 211	67 117	43 80
HAZELTINE	Executive 80/20	1,345 1,695	127 162	75 90	6
EPSON	MX-80 F/T Printer	745 895	71 86	42 48	32
TIMEPLEX	E0400 4 Channel Stat Mux E0800 8 Channel Stat Mux	1,525	147 197	82 110	5

FULL OWNERSHIP AFTER 12 OR 24 MONTHS + 10% PURCHASE OPTION AFTER 36 MONTHS

### **MICROCOMPUTERS**

### APPLE . COMMODORE . HP85 . DEC LSI 11

ACCESSORIES AND PERIPHERAL EQUIPMENT



TRANSNET CORPORATION
1945 ROUTE 22 - UNION, N.J. 07083 - (201) 688-7800



# **DISTRIBUTORS — DEALERS** FOR A UNIQUE NEW PRODUCT

# AVAILABLE ALSO TO END USERS

Micro, mini and mainframe users can cut costs and save time with Keele Codes unique E40 compression utility.

If you - make back-up copies from Winchester or floppy disk

- -archive your database files
- -save reports or correspondence on tape or disk
- need more media space accessible from the terminal
- -send written material via line or telephone

then Keele Code E40 could halve your disk costs and save transfer time by compressing natural English to about 40% of its original size. Through compression you achieve more than twice as much material on each disk in the same time as it would take to make a copy.

Optimised for English - E40 will compress any written/data/program material and all 256 ASCII characters can be coded and faithfully restored. Numeric tables too!

Available for most CP/M machines, including 8" IBM, Xerox 820, Superbrain, North Star, Z80 Apple, Osborne, Vector, Heath/Zenith,

Also available for PDP11 and GEC 4080 series. Other languages to follow.

Write or phone for full details Keele Codes Limited, University of Keele, Keele, Staffs. ST5 5BG England. Tel: 011 44 782-629221. Telex: 851 36113.

Youm	Cut out the coupon Nastercharge accepted. ay phone or telex your orde	BS/01
Please send r E40 for CP/N		Tick
E40 for CP/IV	Retail price: (inc air mail post	age)
CP/M manua further detail	al onlyRetail prices	\$15
Name		
Address		
l enclose a ch money order	neque/ for	
Mastercharg	je	
My compute	ris	
Year of purch	nase	

443

# PERFECT MATCH

### Wed a Data General Eclipse to the **ALPS Word Processing System**

Marry ALPS word processing software with Data General terminals for a complete text entry, editing, formatting and text output system.

The wedding costs about \$4.000

You get all standard word processing features with:

Fast response.

- "Short Stroke" dictionary facility that provides user defined shorthand and spelling correc-
- Ease of use for minimal training.
- Search and replace feature vields quick replacement of selected characters or strings.

Plus these options:

 Foreign language capability for rapid translation and word processing in any Romanized alphabet.

Dictionary look-up of words and phrases to improve trans-

lation production.

For complete information on any ALPS system, contact ALPS, 750 North 200 West, Suite 104, Provo, Utah 84601. Telephone 801/375-0090.



# 8086 SOFTWARE

From Dynamic Microprocessor Associates, Inc.

EM80/86™

An emulator which will permit an 8086, using 86-DOS (IBM Personal DOS, MS-DOS, SB-86\*) or CP/M-86\*, to run CP/M\* programs written for 8080 without modifications. Complete system \$200.

THE FORMULA™

An information manager incorporating characteristics of a data base manager, a word processor, and a compiler language into a "system language" for application development. Delivered with the General Accounting System including General Ledger, Accounts Payable, and Accounts Receivable. Complete system \$595; manual only \$60.

ASCOM<sup>TM</sup>

The Asynchronous Communication Control Program allows a microcomputer to communicate with another computer through a serial port; ideal for interfacing with a time sharing system. Includes various protocols and supports both batch and interactive processing. Complete system \$175; manual only \$20.

UT86™

System utilities designed to improve the user friendliness of systems using 86-DOS. UT86 provides neatly formatted and sorted directories, interactive copy routines which permit selection of individual files or groups of files, formatted file printouts with pagination and headings, and more. Complete system \$180.

THE FOUNDATION™

An advanced data entry and query language. Available Summer 1982.

DMA • WE SPEAK YOUR LANGUAGE

Dynamic Microprocessor Associates, Inc.

545 Fifth Avenue, New York, New York 10017 • (212) 687-7115

We ship prepaid and COD orders. Shipping & Handling charges extra: \$5 UPS areas; \$7 non-UPS areas, Mexico, Canada, \$10 + elsewhere. MasterCharge and VISA accepted. \*Trademarks: 80-DOS, Seattle Computer Products; CP/M and CP/M-86, Digital Research; SB-86, Lifeboat Associates; MS-DOS, Microsoft.

Pressing I twice in a row yields the original character. The drawback to use of this command is that shifting causes black pixels to be brought in on one edge of the pallet. If you want a white background, these pixels must be filled in separately. The alternative is to make the background black before shifting, then change the background back to white with the Invert command.

Terminating the Edit

Once you are satisfied with an edit, type N (for new character). This makes the change permanent. The ABORT, QUIT, MAKE CHARAC-TER prompt is then displayed and a new character may be selected for edit, or the new characters may be saved in the output file with the Q command. Then you are asked whether you want to begin a new edit session. Typing N terminates the program. Typing Y causes prompts for new input and output files to appear. If a null (Return key only) is entered for either file name, the program is terminated.

Using the New Character Set

In order to use a character set that you create, you must rename the file output from CHEDIT to SYS-TEM.CHARSET. This is required by the TURTLEGRAPHICS unit.

The alternative is to write your own versions of WCHAR, WSTRING, and CHARTYPE by using DRAWBLOCK, in which case you must match some of the declarations made in CHEDIT (charimage, charset, and charfile), and read in the character-set file of your own choosing (see procedure drawallchars).

Summary

CHEDIT is a simple editor for Apple-format character sets. If required, modifications should be easy to make. I graciously forgive Apple for providing such a limited form of graphics support with its Pascal package; it is adequate for many small applications. But with CHEDIT, there is no reason why you should be restricted only to the character sets provided by Apple.■

### CP/M Compatibility for your TRS - 80

Pluggable boards & powerful operating system (T8/0S) run this power packed lineup of CP/M program applications

on your Wordstar\* dBase II\* Quic-N-Fasi Data Base Magic Wand Word Tim III\* Processing Management **TRS-80** Mail Merge\* Calc Star Financial Mail Model Modelina Management Mailman Super Calc\* l or III Special Business Spellstar Applications Applications Supersort' The

# Freedom Family

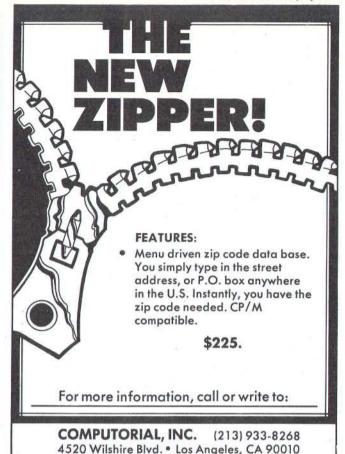
Freedom Option......\$275.00 CP/M Compatibility

Freedom Plus ..... CP/M Compatibility Plus 64K RAM Manual Only \$25.00

### Freedom Technology International, Inc.

Helping Small Computers Do Big Things To Order call 1-800-523-4067 In Pennsylvania call 569-2381 Dealer Inquiries Invited

\*CP/M is a trademark of Digital Research, Inc. \*TRS-80 is a trademark of Tandy Corp.



# SERVING YOU SINCE 1947

CABLE: "OLYRAV" I SA Main Showroom & Offices: 216 So. Oxford Ave. Los Angeles, CA 90004

Telex: 67 34 77

**WE HONOR VISA** and MASTERCHARGE





ORDER DESKS open 6 days a week! 7:00 am to 7:00 pm Mon thru Sat Order Desks: (213) 739-1130

TOLL-FREE TOLL-FREE (outside Calif.) (within Calif) 800-421-8045 800-252-2153

Prices shown are for mail or phone orders; Walk-in slightly higher.

Goods subject to availability; OSC will meet or beat almost any advertised price as long as any advertised price as long as the competition has the goods on hand; not responsible for typographical errors; prices & specifications subject to change without notice; this ad supercedes all previous ads: min shpg & h



HP-87 32K Bytes standard \$1885.00 82907A 82908A 82909A 32K Mem. mod. 239.00 64K Mem. mod. 337.00 128K Mem. mod. 537.00 HP-85A HP-125 \$1985.00 Computer Computer 1985.00 HP-41C HP-41CV HP-41 HP-41 HP-41 Prog. scientific Prog. scientific Card reader 188.00 248.00 169.00 297.00 Optical wand 82106A 41C Memory module 41C Quad mem. mod HP-IL interface 26.00 84.00 109.00 437.00 82170A 82160A 82161A Cassette drive HP-IL printer Prog. scien/printer Scientific 397.00 584.00 55.00 89.00 82162A 82162A HP-97 HP-32E HP-33C HP-34C HP-37E HP-38C HP-11C HP-12C 82006 A

Prog. scientific Adv. prog. scientific Business Prog. financial Prog. scientific Prog. financial Impact printer 5%" dual drive 8" dual drive Impact printer

119.00 114.00 127.00

619.00

Letter qual. ptr. Mass storage ROM Plot/print ROM I/O ROM 85-15001 85-15002 85-15003 Matrix ROM
Adv. prog. ROM
Assembler ROM
16K mem. module
HP-IB interface 85-15005 85,15007 82903A 82937A Serial interface GPIO interface

82905A 82901M

9895A 2631B 2601A

82941 A

1699.00 4499.00 2999.00 2999.00 124.00 124.00 124.00 124.00 124.00 129.00 169.00 328.00 338.00 408.00 **BCD** interface 82949A Parallel ptr. int. HP-7470A Hi-speed color graphic 239.00 1269.00 plotter w/interface

\$325.00 **44**3 MATTEL ELECTRONICS INTELLIVISION

Most animated TV game! Large selection of cartridges!

Cost: \$77095

New TI-99/4A - 48K RAM 100% TI parts w/Extended Basic or TI-LOGO Re: \$1300 Y/C: \$\$689.95

### īexas Instruments Home Computer TI-99/4A

16K

10" color monitor high res 32K memory module Extended Basic Speech synthesizer Disk memory drive Telephone coupler (modem) r (solid state TI-LOGO

\$29995 RETAIL Your Cos 374.95 **339.95** 399.95 **314.95** 100.00 75.00 149.95 129.95 499.95 394.95 224.95 189.95 399 95 319 95

Only

High Quality Monitors Model Description 180 12" B/W, 12 MHz 308-G 12" Green: 18 MHz Retail Cost 189.00 149.00 269.00 199.00 kr 499.00 359.00 1295.00 799.00 Color I 13" Color, NTSC comp. input, audio amp & sp Color II 13" Color, RBG input, hi res graphics, spkr

SANYO MONITORS

High resolution, number one seller! 15" Black & white 390,00 1195,00 199.00 13" color (DM 6113) RGB, High Res 989.00 449.00 269.00 249.00 13" color (new) high quality!
12" Green phosphorous
12" Black & white
9" Black & white (the best seller) 650.00 360.00 340.00 179.00 199.00 235 00 295.00

**Ecommodore** COMPUTER 5K Personal Computer VIC=20

(Expands to 32K) Works with any TV! Retail:\$300.00 Your SPECIAL Cost:\$259.95
FREE with purch of VIC-20 one \$49.50 LCD Pen Watch!
Commodore Datasette Recorder
for VIC-20 Your Cost:\$68.95 We carry all peripherals,

software & access, for the VIC-20 (we will beat any price!)

### IN STOCK ATARI® COMPUTERS

FOR ATARI 400 & 800-GHOST HUNTER (similar to Pac-Man) Disk \$34.95 Cassette \$29.95

1080.00 **689.95** 1280.00 **789.95** 16K 48K 800 800 Disk drive 600.00 469.95 200.00 169.95 Atari VisiCalc Impact Ptr 1000.00 779.95 SUPER SPECIAL-ATARI 400 (16K) Retail:\$595.00 Your Cost: \$299.95 400 Lang. card opt. \$49.95



Programmable Color TV Game Your Cost: \$13995

Retail \$225.00

Atari's game cartridge

ac-man is HERE! While supply lasts-the hottest game in town!

OSON PRINTERS Your Cost \$339.95 449.95 MX70 MX80 MX80 MX80 FT MX100 Graphtrax

COMPUTERS Retail Your Cost \$1530.00 **\$1139.00** 645.00 **549.00** 525.00 **459.00** Apple II 48K+ Disk w/controlle Disk w/o 495.00 795.00 395.00 389.00 669.00 339.00 Pascal language system Graphics tablet Silentype Family Syste 2495.00 1999.99 Apple III 128K 3495.00 2895
Profile 5Mb 3495.00 2795
Software & access. at similar discounts 2895.00

445

# Give Your Apple a Voice

## A Speech-Development System Using the Radio Shack Speech Synthesizer

John Blankenship
Professor of Computer Technology
DeVry Institute of Technology
2858 Woodcock Ave.
Atlanta, GA 30341

"Speech. It separates man from the lower forms of life and from mere machines." In the not-too-distant past, this statement would have been true. Now, with many consumer products gaining the power of speech, it seems only natural that the complete home-computer system have the power of verbal communication.

I added the power of speech to my Apple II with the aid of a Radio Shack Voice Synthesizer. To make the same conversion with your Apple you will need to tinker with its hardware: if you own a TRS-80 you will have to modify some of the software presented here, and if you own anything else you will have to do a little of both. I will attempt to cover the subject in such a manner that modifications will be as painless as possible. They might even be fun!

### Speech Alternatives

I had wanted to add the power of speech to my computer for some time and had explored several alternatives. I found that the best speech quality resulted from methods that reproduced, rather than created, the human sounds desired.

A simple sampling method that uses an A/D (analog-to-digital) converter can produce superb sound quality if the sample rate is suffi-

ciently high. Each sample, however, uses 1 byte of memory, so it is not unreasonable for one second of speech to require 4000 bytes. In addition, the vocabulary is fixed and considerable effort is required to increase it.

Another method for reproducing speech is LPC (linear predictive coding). This technique is used in Texas Instruments' Speak & Spell, and while it reduces the memory requirement to several hundred bytes per second, the quality of speech is slightly reduced (and it still has the disadvantage of a fixed vocabulary).

The Radio Shack Speech Synthesizer generates the sounds that make up speech, called phonemes, through the use of Votrax circuitry. The Speech Synthesizer can generate 45 different sounds, 10 of which are

unicient s	sunus, 10	y. 11.11.911 No.
Phoneme Sound	Example Usage	ASCII Characters
''a'' ''ah''	day honest	)
"aw"	law	1
"e"	meet	E
''eh''	heavy	3
,,00,,	book	%

**Table 1:** Examples from among the 45 phonemes available with Radio Shack's Speech Synthesizer. These sounds can be combined to form words and sentences.

capable of varying durations (see samples in table 1). The major advantage of this method is that the words are not reproduced, but *created* from a single-byte code, which translates to less than 20 bytes for each second of output. These phonemes can be combined in any order, thus permitting an essentially unlimited vocabulary

In the past I had heard speech that was generated from phonemes, and it was generally of poor quality. After a great deal of practice, I discovered that quality was more a function of the programmer than of the hardware. One major consideration in understanding speech is the rhythm. As an example, pronounce the word "kick." You will notice a pause before the last "k." The word flow can be improved through the insertion of such pauses.

Even the phonemes themselves can present problems. Let's examine the word "name." When asked what sounds form this word, most people initially respond with "n", "a", "m", where the "a" is long. If these sounds were sent to the synthesizer it would say something that resembled "name," but it would hardly sound proper.

A closer examination of the word "name" reveals the sounds "n", "a", "e", "m", where both the "a" and "e" are long. When these sounds are re-

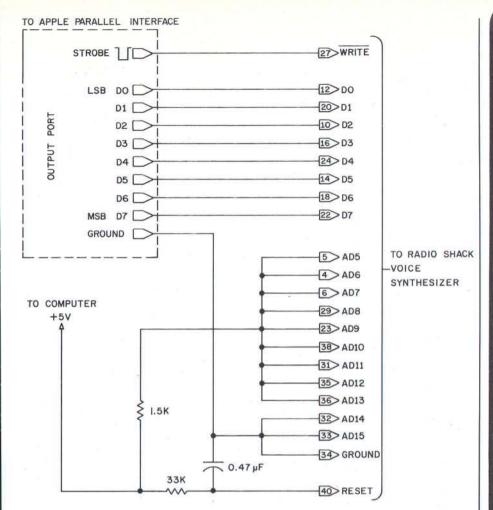


Figure 1: Schematic diagram for the interface between the Apple II Parallel Interface card and the Radio Shack Speech Synthesizer.

produced by the synthesizer, the word is easily recongnized. Now, however, the word ends too abruptly. The addition of another "m" to form the combination "n", "a", "e", "m", "m" sounds nearly human. (By lengthening the "a" or the "e" sound you can attain a pronunciation applicable to a particular region of the country.)

Word flow can also be improved by the addition of such neutral phonemes has "eh" and "uh." The transition between sounds in the word "name" is improved by adding an "uh" between the "n" and the "a" sounds.

By varying these techniques, I convinced myself that above-average speech quality could be achieved with phonemes. In order to manipulate the sounds quickly and easily, I decided to write a program that could perform the following:

- Aid in determining the proper
- Keep those sounds in a dictionary
- · Convert words to sounds automatically

I wanted to write the program in a modular format for two reasons. First, although the program would be written on an Apple II, I expected that many Radio Shack TRS-80 owners would want to convert it. The use of small modules, each with specific functions, would simplify the modification process considerably.

Second, although this program would be used to develop a dictionary, it would also be used in an application program to decode and output the words. If I wrote the original program in modules, the sections not required in the application program could be deleted to conserve memory.



To celebrate our opening, we are matching any advertised price. Just show us the ad.

### ORDER TOLL FREE - Dutside WI 1-800-826-1589

299

### SOFTWARE

Grapiipower								-		11.5		1		+	*	*
Tax Preparer '82																
leal Estate Analyzer .																
reative Financing																
Vord Processor 1	,	4		-	4					. ,		ı,				
B Master		-														
Aail Management				3	7			9				2				
Aicropro Wordstar (Ap																
Aailmerge (CP/M)																
pellstar (CP/M)																
Supersort II (CP/M)																
Context Connector																
Easywriter (Pro)																
Easymover		1	14		1			,		1	0		1	1	1	1
Superscribe II																
Easymailer																
Datadex	*	t			4	•		*	1			2	1		۰	Ť
Microplan Basic																
Wizardy																
Nevada CoBol																
/isicalc (3.3)																
Apple Panic																
SpellGuard																
Computer Air Combat															i	
FS & Report		7	7	1	'n.									Ŷ.		2
ublogic Flight Simula	to	r		-2			Ĺ									
peedStar																
ystems Plus Acc'tg.	M	nd	ule		ì						1	Ţ		ì	i	
rossword Magic						-	•	9.	*					•		
ork II			V.	Ť	ŀ	1		1			5	1	-	-	1	٥
du-ware (Apple)																
ainter Power																
nvoice Factory																
ocksmith																
Raster Blaster																
SuperCalc	7			*	*	+	3					-	*			
/isiterm																
/isiplot	1				1		4	1			-	+		t	*	
/isidex																
/isitrend/Visiplot																
Magic Window																
nt'l Grand Prix																
stimator				-		4				3						÷
-stat 79	161				,							-				
uperVyz																
raphic Software		20			9						1		1	į.		Į.
.O.R.P. I																
nack Attack				1	î						*	-			*	
lectronic I, II, or III .	(0)	000				4					-		-	40	*	
VordPro 3 +	Ť			1	1	*	*		*		1	1	1	*	9	
Mailing List Program					à	4								4		-
haming List Program .	*	+	1	+	1	4	1	*	-		+			٠	٠	+
Apple Doc	+		. 10	-	4	4	٠	*			7	y	4	-	A	
ANID				A		N	11	N.		-		1	-		r	•

### ... AND MANY MORE!

Quoted prices valid for stock on hand and subject to change without prior notice.

> Programs for popular microcomputers.

Ask for our FREE catalog.

For Peripherals see our other ad, page 212

- Wisconsin residents add 4% sales tax
- Add \$2.50 for shipping per software and small item. Call regarding others.

### We Welcome

- Visa, Mastercharge (Add 4%)
   Checks (Allow 1-2 weeks for clearing)
   COD (Add \$1.50 per shipment)

### TOLL FREE - Outside Wisconsin 1-800-826-1589

For Technical Info & in Wisconsin

715-848-2322

**Oryx Software** 

205 Scott St., Dept. BB P.O. Box 1961 • Wausau, WI 54401





Photo 1: The Radio Shack Speech Synthesizer with the author's adapter for the Apple II computer.

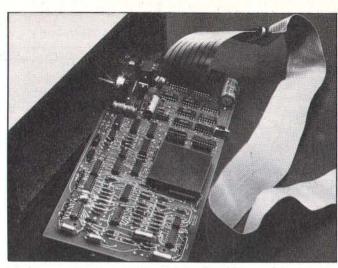


Photo 2: Inside the Speech Synthesizer. The Votrax circuitry is encased in plastic, and none of the supporting integrated circuits have markings.

Let's take a closer look at the Radio Shack Voice Synthesizer to determine the requirements of such a program.

### What the Synthesizer Needs

The synthesizer (see photo 1) has a built-in amplifier and speaker, and the ribbon cable plugs directly into the TRS-80 keyboard or expansion connector. It uses memory-mapped I/O (input/output) so that anything stored in the last 32 screen memory locations is sent to the synthesizer.

In order to use this system with my Apple II computer, I made an adapter (also shown in photo 1) to connect it to my parallel interface card, which doubles as my printer interface when

the system is not speaking. The only unusual requirement of the adapter is that the memory-mapped port inside the synthesizer must be hardwired to an address that will keep it enabled. I also added a power-on reset so that I would not have to contend with random sound each time the unit was turned on. Figure 1 shows the schematic for the adapter.

It is difficult to identify any of the internal circuitry of the synthesizer. The Votrax unit is completely sealed. and none of the surrounding integrated circuits are marked (see photo 2). But the central component, the Votrax SC-01 integrated circuit, is available to experimenters from the

Micromint, 917 Midway, Woodmere, NY 11598, (516) 374-6793.

### Software

Actual operation of the unit is easy. Listing 1 shows a simple program that converts entered sentences to phoneme codes and sends the codes to the synthesizer.

The words and their respective sounds are kept in data statements. I soon found that the major disadvantage of this method was loss of speed. After I acquired several hundred words in my dictionary, the time that elapsed between words spoken became several seconds; this is obviously excessive for real-time output. However, the small program works well for vocabularies of less than 100 words, and it is very easy to add to an application program.

In addition to the speed problem of those applications that require large vocabularies, I still needed to develop the proper sounds. The program in listing 2, which fulfills all of the reguirements set forth earlier, is the result of my effort. Let's examine each module in this program individually.

The first section provides the basic documentation. Note that all variables start with the letter T. In general, variable names should be easily identifiable, but I chose to modify this policy. Since this program would be added to other programs, I wanted to avoid using the same variable in both.

Text continued on page 454

Listing 1: Simple Apple program to convert sentences into phoneme codes. This routine uses information stored in DATA statements and performs a linear search to produce the proper output. The relatively slow speed limits it to use with vocabularies of less than 100 words.

```
INPUT TS
10
    GOSUB 60000
15
    END
30
60000 T16 = "":OUT = 49361
60005 FOR T = 1 TO LEN
60007 T15 = T15 + MIDS
60010 IF MIDS (T5,T,1)
                         LEN (TS)
                       MID$ (T$,T,1)
$,T,1) = " " T
                                      THEN 60050
60020
        NEXT T
60030
        RETURN
60050
        RESTORE
60055
        READ T25, T36: IF T15 (
                                                " " THEN 60055
60057
       T35 = T35 + "
60060
        FOR T1 = 1 TO
                          LEN (T35)
        POKE OUT, ASC ( MID$ (T3$,T1,1))
60070
60071
        PRINT MIDS (T35,T1,1);
POKE (OUT + 3),0
60080
60090
        NEXT TI
60095
       T15 =
                   GOTO 60020
60100
        DATA
               YOU, YCCU
                WILL, WW#!I##LLO
60101
        DATA
                NOT, "NNA; ABTTO
60102
        DATA
                LIE, "OLAA, A*O"
60103
        DATA
60104
        DATA
                TO . TTH (UUUO
60105
        DATA
                ME, MME . 60
```

### THE LIBRARY OF

# **COMPUTER AND INFORMATION SCIENCES**

—the oldest, largest and most respected book club for the computer professional



# Take any 3 books for only \$1.00 each (values to \$74.95)

You simply agree to buy 3 more books—at handsome discounts—within the next 12 months.

(Publishers' Prices Shown)

56680. INVERSIONS: A Catalog of Caligraphic Cartwheels. Scott Kim. Explores the myriad mysteries of written human language and the way in which the human brain interprets it. Softcover. \$8.95

52140-2. THE HANDBOOK OF ARTIFICIAL IN-TELLIGENCE. Volume 1. Edited by Barr and Feigenbaum. An outstanding collection of articles which demonstrate how computers exhibit near-human intelligence. Over 400 pages. Counts as 2 of your 3 books. \$30.00.

42000-2. DESIGN AND STRATEGY FOR DISTRIBUTED DATA PROCESSING. James Martin. Coverage of the impact of DDP on the ultimate users of a system, the office-of-the-future concept and much more. Counts as 2 of your 3 books. \$37.50

82522. TEACHING YOUR COMPUTER TO TALK: A Manual of Command and Response. Edward R. Teja. A fact-filled guide to voice equipment for computers. \$15.95

42053-2. DESIGNING A DISTRIBUTED PROCESSING SYSTEM. Hamish Donaldson. Includes file strategy. communication networks, and workflow design. Counts as 2 of your 3 books. \$34,95

54425. IDA: A User's Guide to the IDA Interactive Data Analysis and Forecasting System. Ling and Roberts. An essential handbook that explains how to use the IDA package. \$12.50

70745. A PROGRAMMER'S GUIDE TO COBOL. William J. Harrison. \$18.95

70691. PROGRAM FLOW ANALYSIS. Edited by Muchnick and Jones. A comprehensive look at a statistical method which can yield more efficient and reliable software. \$23.50

62757. MINICOMPUTERS: Low-Cost Computer Power For Management. Revised Edition. Donald P. Kenney. How to use minicomputers to cut data processing costs and set up more manageable information handling systems. \$14.95

79167. SOFTWARE RELIABILITY GUIDEBOOK. Robert L. Glass. Analysis of technical tools available for software design and implementation. Includes applications for small operations to mammoth projects. \$18.95

**39960.** COMPUTER-ASSISTED DATA BASE DESIGN. *George V. Hubbard.* A complete look at data models, editing, design tactics, root anchor points and much more. \$24.95

39977-2. COMPUTER CONTRACT NEGOTIA-TIONS. Auer and Harris. Shows the computer professional how to handle every phase of successful negotiation, from preparation through signing the final agreement. Counts as 2 of your 3 books. \$34.50

34115. APL IN PRACTICE. Edited by Allen J. Rose et al. Covers topics including writing maintainable APL codes, evaluating telecommunications networks, using APL for construction accounting and more. \$25.00

70230. PRINCIPLES OF SOFTWARE ENGINEER-ING AND DESIGN. Marvin V. Zelkowitz et al. A practical guide which shows you how to handle every-thing from small programs all the way through the design of large, complex software systems. \$24.50

78333-2. SIMPLIFIED ACCOUNTING FOR ENGINEERING AND TECHNICAL CONSULTANTS. Hayes and Baker. Easy-to-follow, plain language format. Covers partnership share accounting, compensation plans, time accounting, systems of billing and more. Counts as 2 of your 3 books. \$27.95

53667-2. HOW TO BUILD YOUR OWN SELF-PROGRAMMING ROBOT/ROBOT INTELLIGENCE ...WITH EXPERIMENTS. David L. Heiserman. A two-volume set. Counts as 2 of your 3 books. \$29.90

42420. THE DISTRIBUTED SYSTEM ENVIRON-MENT: Some Practical Approaches. Grayce M. Booth. Covers horizontal and hierarchical distributed structures, networking and much more. \$21.95

34440. THE ART OF ELECTRONICS. Horowitz and Hill. Emphasizes circuit intuition and non-mathematical design techniques. Packed with diagrams, schematics, and illustrations. \$24.95

51955-2. A GUIDE TO THE SUCCESSFUL MANAGEMENT OF COMPUTER PROJECTS. Hamish Donaldson. Invaluable advice on project management and documentation, systems design strategy, and programming. Counts as 2 of your 3 books. \$34.95

79155. SOFTWARE INTERPRETERS FOR MICROCOMPUTERS. Thomas C. McIntire. How to design a reliable software interpreter for any microcomputer system. \$23.95

42213. DICTIONARY OF BUSINESS AND MAN-AGEMENT. Jerry M. Rosenberg. Over 8000 entries. \$24.95

81895. SYSTEMS ANALYSIS AND MANAGE-MENT: Structure, Strategy, and Design. Donald V. Steward. Insightful discussion of critical path scheduling, management modelling, system modelling, structural models and more. \$25.00

32270-2. ADVANCES IN COMPUTER PROGRAM-MING MANAGEMENT. Vol. I. Edited by Thomas A. Rullo. Covers programmer evaluation, goal setting and performance standards, productivity measurements and more. Counts as 2 of your 3 books. \$29.50

48494. FILE TECHNIQUES FOR DATA BASE OR-GANIZATION IN COBOL. Johnson and Cooper. Includes technical considerations in choosing a file structure, data structures and more. \$20.95

42303. A DISCIPLINE OF PROGRAMMING. Edsger W. Dijkstra. A programming classic. \$22.95

70725-2. THE PROGRAMMER'S ANSI COBOL REFERENCE MANUAL. Donald A. Sordillo. Alphabetized and heavily cross-referenced, provides a complete reference to COBOL verbs, syntax concepts and uses. Counts as 2 of your 3 books. \$27.95

81857. SYSTEMATIC PROGRAMMING. Niklaus Wirth. A classic work on programming as an exercise in constructing algorithms by the noted author. \$23.95

79240. SOFTWARE PSYCHOLOGY: Human Factors in Computer and Information Systems. Ben Shneiderman. \$24.95

If reply card has been removed, please write:

The Library of Computer and Information Sciences
Dept. 7-BB3, Riverside, N.J. 08075, to obtain
membership information and application.

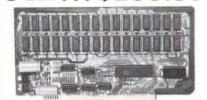
### EXTRAORDINARY-VALUE!



ENCYCLO PEDIA
OF COMPUTER
SCIENCE.
Edited by Anthony
Ralston. Monumental
1,500-page volume on
every aspect of the
computer sciencessoftware, hardware,
languages, programs,
systems, mathematics
and more. Over 700
charts, tables, graphs
and diagrams.
Counts as 3 of your 3
books. \$60,00

# Bigsale On K's

48K...\$249.9



**New IAWS-IB** The Ultrabyte Memory Board

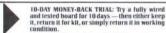
Due to the tremendous success of our IAWS I, we were able to make a special purchase of first-quality components at below-cost prices for JAWS-IB. And we are sharing our cost saving with you. But don't be surprised if the next time you see this ad the prices have gone up substantially. Better yet, order now, and get the best memory on the market at the best price on the market.

ONE CHIP DOES IT ALL

Jaws-IB is the Rolls-Royce of all the S100 dynamic boards. Its heart is Intel's single chip 64K dynamic RAM controller. Eliminates high-current logic parts .. delay lines ... massive heat sinks ... unreliable trick circuits. JAWS-IB solves all these problems.

LOOK WHAT JAWS-IB OFFERS YOU

Hidden refresh ... fast performance ... low power consumption ... latched data outputs ... 200 NS consumption . . . latched data outputs . . . 200 NS 4116 RAM's . . on-board crystal . . RAM Jumper selectable on 8K boundaries . . fully socketed . . . solder mask on both sides of board . . . phantom line . . . designed for 8080, 8085, and Z80 bus signals . . works in Explorer, Sol, Horizon, as well as all other well-designed \$100 computers.



Continental U.S.A. Credit Card Buyers Outside Connecticut: TO ORDER CALL TOLL FREE 800-243-7428

(203) 354-9375

JAWS-I																			
																			\$149.95*
□ 32K.																ï			\$199.95*
□ 48K.			٠.																\$249.95*
□ 64K.																			\$200 05*
the second of		9.15								٠.				٠,					4433.33
IAWS-I	RF	ille	v /	10	SP	m	h	le	d	-	/i	ne	d	2	r	10	te	rl	
IAWS-I	RF	ille	v /	10	SP	m	h	le	d	-	/i	ne	d	2	r	10	te	rl	
JAWS-I	BF	all	y /	As	se	m	b	le	d,	v	Vi	re	d	8	Te	s	te	d	
JAWS-I □ 16K □ 32K	BF	all	y /	As	se	m	b	le	d,	v	Vi	re	d	8	 Te	S	te	d	: \$179.95*

EXPANSION KIT, 16K RAM Module, to expand

JANA 9-10 III	10K DIOCKS UP to 04K.	\$59.95
	\$2 postage and insurance sidents add sales tax.	: (\$4.00 Canada).

□ VISA □ Mast	☐ Money Order or Cashier's Check er Card (Bank No. )
Acct. No.	Exp. Date
Signature Print Name	
Address	
City	

**NETRONICS R&D Ltd.** 333 Litchfield Road, New Milford, CT 06776 Listing 2: Completed speech-development program for the Apple. This program incorporates features that help determine proper sounds, maintain a dictionary, and automatically convert entered words to sounds.

```
60000
        REM *************
60001
        REM *
                   SPEECH
60002
        REM *
                 DEVELOPEMENT
60003
        BEM *
                   SYSTEM
60004
        REM *
                     RV
60005
            * JOHN BLANKENSHIP
        REM
60006
60007
             THIS PROGRAM HAS BEEN DESIGNED TO BE INCLUDED INTO ANY
        REM
80008
        REM
             OTHER PROGRAM REQUIRING SPEECH OUTPUT
60009
        REM
60010
              ALL VARIABLES BEGIN WITH 'T' TO HELP PREVENT CONFLICTS
        REM
60011
        REM
             WHEN WRITING THE APPLICATION PROGRAM
60012
        REM
             THE ENTIRE PACKAGE PROVIDES FOR COMPLETE DEVELOPMENT AND MAINTENANCE OF A PHONETIC DICTIONARY AS WELL AS THE SOFTWARE TO MAKE THE REQUIRED RUN TIME CONVERSIONS
60013
        REM
60014
        REM
60015
        REM
60016
        REM
60017
        REM
             THE SYSTEM IS MODULAR SO THAT UNNEEDED ROUTINES MAY BE
60018
             DELETED FROM THE APPLICATION PACKAGE
        REM
60019
        REM
60020
        REM *************
        REM *
                INITIALIZATION *
60021
        REM *************
60022
        DIM TW$ (300) . TP$ (300)
60023
60024
        LET DS =
                  CHRS (4)
        REM ***********
60026
60027
        REM *
                     MENU
        REM *************
60028
        TEXT : HOME
PRINT "
60029
60030
                        SPEECH DEVELOPEMENT SYSTEM"
        PRINT "
                       WRITTEN BY JOHN BLANKENSHIP": VTAB 8
60031
60032
        PRINT "
                     1. INPUT DATA FROM DISK"
        PRINT "
60033
                     2. SAVE DATA TO DISK"
        PRINT "
                     3. PREPARE NEW WORD FOR ENTRY"
60034
        PRINT "
                     4. SAY A SENTENCE"
60035
                     5. LIST DICTIONARY"
        PRINT "
60036
        PRINT "
                         RETURN TO BASIC"
60037
        VTAB (20): PRINT "WHICH? "; GET TT$
IF VAL (TT$) = 6 THEN HOME : END
60038
60039
        LET T1 =
                   VAL (TT$): IF T1 ( 1 OR T1 ) 5 THEN PRINT
60040
                                                                     CHRS (
7): GOTO 60038
60041
        ON T1 GOTO 60043,60062,60081,60137,60122
        REM
60042
60043
        REM **************
60044
        REM *
                 INPUT DATA
        REM *
60045
                   FROM DISK
        REM ***
60046
60047
        HOME
60048
        PRINT "
                        INPUT DATA FROM DISK": VTAB 8
        INPUT "WHAT FILE NAME "; TNS
60049
            LEN (TN$) = 0 THEN 60026
60050
        PRINT DS"OPEN SPEECH. "TNS
60051
60052
        PRINT DS"READ SPEECH. "TNS
60053
        INPUT TA
        VTAB 20: PRINT "FILE ":: INVERSE : PRINT TN$; NORMAL : PRIN
60054
   CONTAINS "TA" WORDS
55 FOR T1 = 1 TO TA
60055
60056
        INPUT TWS (T1)
        INPUT TP$ (T1)
60057
60058
        NEXT TI
        PRINT DS"CLOSE SPEECH "TNS
60059
        GOTO 60026
60060
60061
        REM **********
60062
60063
        REM * SAVE DATA TO DISK *
60064
        REM *************
       HOME : PRINT "
60065
                                 SAVE DATA TO DISK": VTAB 8
60066
           LEN (TNS) = 0 THEN 60069
        IF
60067
        PRINT "USE FILE NAME ";: INVERSE : PRINT TNS;: NORMAL : PRIN
      Y/N) ": GET TT$
IF TT$ = "Y" THEN 60070
T " ? (
60068
        VTAB 12: INPUT "WHAT FILE NAME "; TN$
VTAB 20: PRINT "SAVING "TA" WORDS"
60069
        VTAB 20:
60070
        PRINT DS"OPEN SPEECH. "TNS
60071
```

Listing 2 continued on page 452

State

Total enclosed: \$

FOR ONLY \$129.95 Learn Computing From The Ground Up

**Build a Computer kit that grows** with you, and can expand to 64k RAM, Microsoft BASIC, Text Edi-tor/Assembler, Word Processor, Floppy Disks and more.

### EXPLORER/85

Here's the low cost way to learn the fundamentals of computing, the all-important basics you'll need more and more as you advance in computer skills. For just \$129.95 you get the advanced-design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And if can grow into a system that is a match for any personal computer on the market. Look at match for any personal computer on the market. Look at microprocessor "heart" of the Explorer/85. (Join the millions who will buy and use the 8080/8085 this year alone!). Four 8-bit plus noed-8-bit input/100ty ptor's from which you can input and output your programs, as well as control exterior switches. relays. lights, etc. a cassette interface that lets you store and reload programs you've learned to write. deluxe 2.000 byte operating system/monitor makes it easy to learn computing in several important ways. \* It allows simpler, faster writing and entering of programs \* Ut permits access by you to all parts of the systems you can check on the status of using a standard programs are ply step, with provision for displaying all the contents of the CPU (registers. flags, etc.) \* ... and it does much more!

You get all this in the starting level (Lovel A) of the

contents of the CPU (registers, flags, etc.) • ... and it does much more!
You get all this in the starting level (Level A) of the Explorer(85 for only \$129.95. Incredibile! To use, just plug in your 8VDC power supply and terminal or keyboard/display — if you don't have them, see our special offers below.

Level A computer kit (Terminal Version) ... \$129.95 plus \$3 P&L.

□ Level A kit (Hex Keypad/Display Version) ... \$129.95 plus \$3 Pal.\*

postpaid.

LEVEL C — Add still more computing power, this "building block" mounts directly on the motherboard and expands the \$100 bus to six slots.

Level C kit. 399.86 plus \$2 Pal.

S100 bus connectors (five required) ... \$4.85 each, postpaid.

Description LEVEL D— When you reach the point in learning that requires more memory, we offer two choices: either add 4k of a memory directly on the motherboard, or add 16k to 94k of memory by means of a single \$100 card, our famous

"|AWS" | \$299.95 plus \$2 P&I\* | 64k S100 |
"|AWS" | \$100 |
"|AWS" | \$148.95 plus \$2 P&I\* |
"|AWS" | \$199.95 plus \$2 P&I\* |
"|AWS" | \$249.95 plus \$2 P&I\* |
"|AWS" | \$249.95 plus \$2 P&I\* |
"|AWS" | \$249.95 plus \$2 P&I\* |

LEVEL E — An important "building block." it activates the 8k ROM/EPROM space on the motherboard. Now just plug in our 8k Microsoft BASIC or your own custom

POS STATES AND STATES OF THE S

32X of RAM. floppy disk controller, 8" floppy disk drive)
. \$325 postpaid.

TEXT EDITOR/ASSEMBLER — The editor/assembler is a software tool (a program designed to simplify the task of writing programs. As your programs answere longer and more complex, the asymbler can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassettes. The assembler performs the clerical task of translating symbolic code into the computer-readable object code. The editor/assembler program is available either in cassette or a ROM version.

■ Editor/Assembler (Cassette version; requires Level B" and 8k (min.) of RAM — we suggest 10k "JAWS" — see above). — \$88.99 pits 24 PAI. ■ Editor/Assembler (ROM version; the program is available either in program is available either in the seed to 10k "JAWS" — we suggest 10k "JAWS" — see above). — \$88.99 pits 24 PAI. ■ "FIOPPY DISK — A remarkable "huilding block." Add our 8" floppy disk when you need faster operation, program languages available today. You simply plug them into your Exploger/85 disk system — it accepts all IBM-formatted CP/PM-grograms.

■ 8" Floppy Disk Drive. — \$499.95 pits \$12 PAI." ■ Floppy Controller Card ... \$199.95 pits \$2 PAI. ■ Disk Drive Cabinet & Power Supply. ... \$69.95 pits \$3 PAI."

□ Disk Drive Cabinet & Power Supply. ... \$69.95 pits \$3 PAI."

SJ P6.1."

[] Drive Cables (set up for two drives) ... \$25.00 plus \$1.50 P8.1.\*

[] CP/M 2.2 Disk Operating System: includes Text Editor/Assembler, dynamic debugger, and other features that give your Explorer/68 access to thousands of existing CP/M-based programs ... \$150.00 postpaid.

CP/M-based programs . . . \$150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).

□ AP-1 Power Supply kit (8V ® 5 amps) in deluxe steel cabinet. . . ≥ 3.85 plus \$2 P&1.\*

cabinet ... \$39.95 plus \$2 Pal." NEED A TERMINAL? We offer you choices: the least ex-pensive one is our Hex Keypad/Display kit that dis-plays the information on a calculator-type screen. The other choice is our ASCII Content (Content Theories)



4. Plug in Level E here: uc-cepts Microsoft BASIC or Keyped/Disploy 5. Add two S100 hoards 5. Add Level B to convert to 5100 . Add 4k RAM 7. Connect terminal

a CRT monitor or a TV set (if you have an RF modulator). ☐ Hex Keypad/Display kit . . . . \$69.95 plus \$2 P&L\*

☐ FASTERM - 64 TERMINAL KIT — Featuring a 56 key ASCII Keyboard, 126 character set upper and lower case, 75 6hm output, 8 baud rates: 150 to 19;200 (switch selec-able), RS232/C or 20 MA output, 32 or 64 character by 16 plus \$3 P&I.\*

☐ RF Modulator kit (allows you to use your TV set as a monitor) ... \$8.95 postpaid. ☐ 12" Video Monitor (10MHz bandwidth) ... \$139.95 plus 55 PAL\*

plus \$5 P&I.\*

□ Deluxe Steel Cabinet for the Explorer/85 . . . \$49.95 plus \$3 Pat.\*

| Fan for cabinet . . . \$15.00 plus \$1.50 Pat.\*



### ORDER A SPECIAL-PRICE EXPLORER/85 PAK — THERE'S ONE FOR EVERY NEED.

□ Beginner Pak (Save \$26.00) — You get Level A (Terminal Version) with Monitor Source Listing (\$25 value) AP-1.5-amp, power supply, Intel 8085 Users Manual (Reg. \$199.65) SPECIAL \$169.95 plus \$4 Pal.\* □ Experimenter Pak (Save \$53.40) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display Intel 8085 User Manual. Level A Hex Monitor Source Listing, and AP-1.5-amp, power supply ... (Reg. \$279.95) SPECIAL \$219.95 plus \$67 Pal.\* □ Special Microsoft BASIC Pak (Save \$103.00) — You get Levels A (Terminal Version). B. D (4k RAM). E. 8k Microsoft in ROM, Intel 8085 User Manual, Level A Monitor Source Islaing, and AP-1, 5-amp, power supply ... (Reg. \$439.70) SPECIAL \$329.95 plus \$7 Pal.\* □ Add a Rom-Version Text Editor/Assembler (Requires

☐ Add a Rom-Version Text Editor/Assembler (Requires levels B and D or \$100 Memory). . . \$99.95 plus \$2 P&I\*.

□ Adu a Rom-version 1 ext gainor/ assembler lexibility levels B and Do v S100 Memory). ■ 599. 891 us \$2 PeA!

Starter 8" Disk System — Includes Level A. B Hoppy disk controller, one CDC B" disk-drive, two-drive cable, two S100 connectors; just add your own power supplies, cabinets and hardware ... □ [Reg. \$1050.00] SPECIAL \$599.89 plus \$13 PeA! ... □ 325 Sharter System, \$1105.35 PeA! ... □ 325 Sharter System, \$1105.35 □ S

\*P&I stands for "postage & insurance." For Canadian orders, double this amount.

Continental Credit Card Buyers Outside Connecticut:

### TO ORDER Call Toll Free: 800-243-7428

To Order From Connecticut, or For Technical Assistance, Call (203) 354-9375

CP/M is a reg. trademark of Digital Research

t	(Clip and	mail	entire	ad)	A
-					-

SEND ME THE ITEMS CHECKED ABOVE Total Enclosed (Conn. Residents add sales tax): \$\_Paid by:

☐ Personal Check ☐ Cashier's Check/Money Order ☐ VISA ☐ MASTER CARD (Bank No. ..

NETRONICS Research & Development Ltd. 333 Litchfield Road, New Milford, CT 06776

# ANNOUNCING TWO **NEW TERMINALS**

Smart • Fast • Graphics • Matching Modem and \$295 Printer

Netronics announces a state of the art breakthrough in terminals, Now at prices you can afford, you can go on-line with data-bank and computer phone-line services. It's all yours: "electronic newspapers," educational services, Dow-Jones stock reports, games, recipes, personal computing with any level language, program exchanges, electronic bulletin boards ... and more every day!!!

Netronics offers two new terminals, both feature a full 56 key/128 character typewriterstyle keyboard, baud rates to 19.2 kilobaud, a



necessary subscription forms.

More good news: All the components in our terminals are available separately (see coupon), so you buy only what you need!!!

COUPON), so you buy only what you need!!!

FASTERM-64... DISPLAY FORMAT: 64 or 32 characters/line by 16 lines... 96 displayable ASCII characters (upper 8 lower case)... 8 baud rates: 150, 300, 600, 1200, 2400, 4800, 9600, 19, 200, (switch sel.)... LINE OUTPUT: RS232/C or 20 ma current loop... VIDEO OUTPUT: 197 (PIEA RS-170)... CURSOR MODES: home & clear screen, erase to end of line, erase cursor line, cursor up & down, auto carriage return/line feed at end of line & auto scrolling. REVERSE VIDEO... BLINKING CURSOR... PARITY: off, even or odd... STOP BITS: 1, 1.5, 2... DATA BITS PER CHARACTER: 5, 6, 7 or 8... CHARACTER OUTPUT: 5 by 7 dot matrix in a 7 by 12 cell... PRINTER OUTPUT: prints all incoming data... 1K ON BOARD RAM... 2K ON BOARD ROM... CRYSTAL CONTROLLED... COMPLETE WITH POWER SUPPLY... OPTIONAL GRAPHICS MODE: includes 34 Greek & math characters put 30 special graphics characters... ASCII ENCODED KEYBOARD: 56 key/128 characters. aSCII ENCODED KEYBOARD: 56 key/128 characters. SMARTERM-80... DISPLAY FORMAT: 80 characters by 26 lines or 40 characters by 16 lines 128 displayable ASCII characters (upper & lower case) 8 baud rates: 110, 300, 600, 1200, 2400, 400, 9600, 19, 200... LINE OUTPUT: 17 RS232/c or 20 ma current loop... VIDEO OUTPUT: 1V pp (EIA RS-170)... EDITING FEATURES: insertidelete line, insertidelete characters, for wardback tab... LINE OF PAGE TRANSMIT... PAGE HINT FUNCTION. GRAPHICS: 12,000 kizel resolution block plus line graphics... ON SCREEN PARITY INDICATOR... PARITY: off, even or odd... STOP BITS: 1.10 baud 2, all others 1... CHAR. OUTPUT: 7 by 11 character in a 9 by 12 block... PRINTER OUTPUT: 1... 80 OR 50 hz VERTICAL REFRESH... BLINKING BLOCK CURSOR... CRYSTAL CONTROLLED... 2K ON BOARD RAM... ASCII ENCODED SUPPLY... 50 LOND... FULL DUPLEX, FCC APPROVED... DATA RATE: 300 baud

SUPPLY.

TELEPHONE MODEM 103 O/A ... FULL DUPLEX, FCC APPROVED ... DATA RATE: 300 baud ... INTERFACE: RS232/C and TTY ... CONTROLS: talk/data switch (no need to connect and disconnect phone), originate/answer switch on rear panel ... NO POWER SUPPLY RE-

OUIRED.
ASCIL KEYBOARD ASCIL-3. 55 KEY/128 CHARACTER ASCII
ENCODED. UPPER & LOWER CASE. FULLY DEBOUNCED.
2 KEY ROLLUPPER & LOWER CASE. FULLY DEBOUNCED.
2 KEY ROLLUPPER, POS OR NEG LOGIC WITH POS STROGE.
REQUIRES + 5 & -127 DC (SUPPLIED FROM VIDEO BOARDS)
PRINTER COMET I. SEPIAL I/O TO 9600 BAUD . 80
CHARACTER COLUMN (132 COMPRESSED). 10" TRACTOR FEED
UPPERLOWER CASE. INDUSTRY STANDARD RIBBONS.
4 CHARACTER SIZES. 9 BY 7 DOT MATRIX. BI-DIRECTIONAL
PRINTING



Continental U.S.A. Credit Card Buyers Outside Connecticut

### **CALL TOLL FREE 800-243-7428**

To Order From Connecticut Or For Tech. Assist. Call (203) 354-9375

NETRONICS R&D LTD. Dept. 333 Litchfield Road, New Milford, CT 06776

Please send the items checked below:

☐ COMPLETE FASTERM-64 TERMINAL (includes FASTVID-64 video board ASCII-3 keyboard, steel cabinet and power supply) kit \$199.95 Puss \$3 Pšl graphics option: add \$19.95 to
each of above
COMPLETE SMARTERM-80 TERMINAL (includes SMARTVID-80 video board, ASCII-3 keyboard, steel cabinet and power supply) kit \$299.95 plu \$3 P&I wired and tested \$369.95 plus \$3 P&I .
☐ FASTVID-64 VIDEO BOARD (requires + 5 & -12V DC) kit \$99.95 plus \$ P&I graphics option add \$19.95 wired & tested \$129.95 plus \$3 P&I
graphics option add \$19.95
SMARTVID-80 VIDEO BOARD (requires + 5 & + /-12V DC) kit \$199.95
plus \$3 P&I wired & tested \$249.95 plus \$3 P&I
☐ DELUXE STEEL TERMINAL CABINET \$19.95 plus \$3 P&I
□ ASCII-3 KEYBOARD (requires +5 & -12VDC) kit \$69.95 plus \$3 P&I wired and tested \$89.95 plus \$3 P&I
☐ POWER SUPPLY (powers ASCII-3 keyboard & video boards) kit only
\$19.95 plus \$2 P&I
☐ ZENITH VIDEO MONITOR (high resolution green phosphor) wired &
tested \$149.95 plus \$6 P&I
☐ TELEPHONÉ MODEM MODEL 103 O/A wired & tested \$189.95 plus \$3
P&I
☐ DOT MATRIX PRINTER Comet I wired & tested \$299.95 plus \$10 P&I ☐ RF MODULATOR MOD RF-1 kit only \$8.95 plus \$1 P&I
☐ 3FT-25 LEAD MODEM/TERMINAL OR PRINTER/TERMINAL CONNECTOR
CABLE \$14.95 ea plus \$2 P&I

□ VISA □	neck Cashi MasterCard (Bar	er's Check/Money nk No p. Date	
Signature Print Name _			
Address			*
City		Zip	

### more ...

### SPECTACULAR OFFERS









We stock the complete line of RASE diskettes reel-to-reel tapes, mag cards, disk packs and cartridges. We also carry MAXELL, OPUS and WABASH products. All are 100% certified and fully guaranteed.

Box of 10 diskettes:	51/4"	8"
OPUS ss/sd	 \$20	\$21
BASF ss/sd	 23	24
WABASH ss/sd	 23	24
MAXELL . TOO LOV 51/4 "-10 sector-now a	CA	ALL

Sectoring must be specified.

51/4" or 8" Vinyl Storage Pages ...... 10/\$5

### LIBRARY CASES

8" Kas-sette/10.... ... \$2.99 51/4" Mini Kas-sette/10 . . \$2.49





HARDHOLE DISK PROTECTORS Reinforcing rings of tough mylar protect disk hole edge from damage.

	51/4"	8"
Applicators	\$3	\$4
Hardhole Rings (50)	\$6	\$8

### DISK DRIVE HEAD CLEANING KITS

Prevent head crashes and ensure error-free operation.

51/4" or 8" . . . . . . . . \$19.50



SED C-10 CASSETTES 10/\$7 (All cassettes include box and labels.)



Get 8 cassettes, C-10 Sonic, and Cassette/8 Library-Album, as illustrated, for only ..... \$8

### SNAP-IT POWER CENTER

Turns 1 outlet into 6. Wall mount or portable. Circuit breaker, lighted switch and UL approved.



4"x3"x2".....\$19.95

We also offer printer ribbons, printwheels, type elements, equipment covers, power con-soles, paper supplies, storage and filing equipment, furniture and many other accessories for word and data processing systems. Write for our free catalog.

VISA . MASTERCHARGE . MONEY ORDERS . CERTIFIED CHECK . FOR PERSONAL CHECKS ALLOW TWO WEEKS C.O.D. REQUIRES A 10% DEPOSIT • CAL. RES. ADD 6% SALES TAX • MIN \$2 SHIPPING & HANDLING • MINIMUM ORDER \$10 . SATISFACTION GUARANTEED OR FULL REFUND



8868 CLAIREMONT MESA BLVD. SAN DIEGO, CALIFORNIA 92123

Toll Free 800-854-1555 Order Only For Information or California Orders (714) 268-3537

### Listing 2 continued:

```
PRINT DS"WRITE SPEECH. "TNS
60072
60073
         FOR T1 = 1 TO TA
60074
60075
         PRINT TWS(T1)
PRINT TPS(T1)
60076
60077
         NEXT T1
         PRINT D&"CLOSE SPEECH. "TNS
60078
60079
         COTO 60026
60080
         REM
60081
         PFM **************
         REM * PREPARE NEW WORD *
60082
         REM ***********
60083
         HOME : PRINT " PREPARE AND ADD NEW WORD TO DICTIONARY"
60084
        VTAB 4: INVERSE: PRINT "INSTRUCTIONS": NORMAL PRINT " 1. ENTER PHONETIC SOUND" PRINT " 2. HIT RETURN TO HEAR IT"
60085
60086
                     1. ENTER PHONETIC SOUND"
2. HIT RETURN TO HEAR IT"
3. CONTINUE THE PROCESS UNTIL
60087
60088
60089
       PRINT "
                                                                                      CORRE
CT"
60090
                         4. HIT RETURN (NO ENTRY) TO SAVE"
         PRINT "
60091
         PRINT
         PRINT "
                         NOTE: A SPACE AT THE END OF A WORD
60092
                                                                                        IS
REQUIRED TO STOP SOUND"
60093 POKE 34,12: REM SET TOP OF WINDOW
60094 LET TS$ = ""
60095 REM INPUT LINE WITH EDITING TO MEMORY STARTING AT 512 - THE N CONVERT TO STRING
         POKE 51,160: CALL 64874
LET TS6 = "": FOR T1 = 1 TO 255: IF PEEK (511 + T1) = 141 T
60096
HEN 60099
60098 LET TS$ = TS$ +
                                CHR$ ( PEEK (511 + T1) - 128): NEXT T1
              LEN (TS$) = 0 THEN 60103
60099
          IF
         LET T15 = TS5
LET T5 = TS5: GOSUB 60186
60100
60101
         GOTO 60094
60102
60102 GOTO 60094
60103 IF RIGHTS (T1$,1) = " " AND T1$ ( ) " " THEN T1$ = LEFT$
(T1$, LEN (T1$) - 1): GOTO 60103
60104 PRINT "DO YOU WISH TO SAVE THE SOUND": INVERSE: PRINT T1$;
NORMAL: PRINT " (Y/N) ";; GET TT$: PRINT
60105 IF TT$ ( ) "Y" THEN TEXT: GOTO 60026
60106 INPUT "WHAT WORD HAS THIS SOUND ";TT$
60107 IF LEN (TT$) = 0 THEN 60026
60108 REM FIND ALPHABETICAL DOCUMENTS
                FIND ALPHABETICAL POSITION OF NEW WORD IN ARRAY
          IF TA = 0 THEN 60118
FOR T1 = 1 TO TA
60109
60110
         IF TW$(T1) ( TT$ THEN NEXT T1

IF TW$(T1) ( > TT$ THEN 60115

LET TP$(T1) = T15

TEXT : GOTO 60081
60111
60112
60113
60114
60115
          LET TZ
                     TI
          REM MOVE ARRAY TO MAKE ROOM FOR NEW WORD
60116
60117
          FOR T1 = TA TO T2 STEP - 1:TW$(T1 + 1) = TW$(T1):TP$(T1 + 1
) = TP$(T1): NEXT T1
60118 LET TA = TA + 1
60119 IF T2 = 0 THEN T2 =
60120
         LET TW5 (T2) = TT5 : TP5 (T2) = T15
60121
         TEXT : GOTO 60081: REM
         REM ***********
         REM * LIST DICTIONARY * REM *************
60123
60124
         HOME : PRINT "
60125 HOME : PRINT " LIST DICTIONARY": VTAE 3: PRINT "(A NY KEY TO CONTINUE - ESC FOR MENUE)": VTAE 10
         IF TA = 0 THEN PRINT "NO WORDS IN DICTIONARY": FOR T3 = 1 T
: NEXT T3: GOTO 60026
60126
0 1000:
60127 PRINT "DO YOU WANT THE PRINTER ON (Y/N) "; GET TS
       IF T5 = "Y" THEN CALL 768: REM TURN PRINTER ON HOME: T3 = 1: FOR T2 = 1 TO TA

LET T3 = T3 + 1: IF T5 < > "Y" AND T3 = 20 THEN GET T16: T3

IF T15 = CHR5 (27) THEN 60026
60128
60129
60130
 = 1: IF T1$ =
60131
         PRINT TWS (T2), TPS (T2)
60132
         NEXT T2
         IF T$ ( ) "Y" THEN GET T1$
PRINT D$"PR#0": REM TURN PRINTER OFF
60133
60134
        GOTO 60026
60135
60136
         REM
60137
         DEM annangananananananan
         REM * SAY A SENTENCE
30138
         REM *************
50139
         HOME : PRINT "
30140
                                           SAY A SENTENCE"
10141
         PRINT
                 : PRINT "DO YOU WANT GRAPHICS (Y/N) "; GET TS6
10142
         LET TG = 0: TF = 0: IF TS$ = "Y" THEN TG = 1
10143
         PRINT
10144
         POKE 34,5: VTAB 6: REM SET WINDOW PRINT "WHAT SENTENCE ": INPUT TS$
0145
              LEN (TS$) = 0 THEN 60026
 0146
60147
         GOSUB 60150: IF TG = 1 THEN TEXT : GOTO 60137
60148
         GOTO 60145
60149
         REM
60150
         REM ************
         REM *
60151
                    SAY TS
         REM ************
60152
```

```
IF TG = 0 THEN 60155

IF TF = 0 THEN GOSUB 60192:TF = 1

LET TS$ = TS$ + " ":T1$ = "":T3 = F

FOR T1 = 1 TO LEN (TS$)

IF MID$ (TS$,T1,1) = " " THEN 60161
60153
60154
                                                          FRF (O)
60155
60156
60157
         LET T18 = T18 + MID8 (TS8,T1,1)
60158
60159
         NEXT TI
60160
         RETURN
         REM BINARY SEARCH OF ARRAY FOR WORD
60161
              LEN (T18) = 0 THEN 60159
60162
         IF
         LET TL% = TA: TS% = 1
60163
          LET T2$ = TW$ (TS%) : TT$ = TW$ (TL%)
60164
         IF T15 > T25 AND T15 < TT5 THEN 60168
IF T15 = T25 THEN T = T5%: GOTO 60176
IF T15 = TT5 THEN T = TL%: GOTO 60176
60165
60166
60167
          LET T% = ((TL% - TS%) / 2) + TS%
60168
          LET TYS = TWS (T%)
60169
60170
          REM NOT FOUND - SEND ORIGINAL WORD
          IF TYS = T9 THEN TS = T15:T16 = ""; GOSUB 60181: GOTO 60159
60171
         LET TS - TVS
60172
          IF T15 > TYS THEN 60175
60173
         LET TL% = T%:TT2 = TY5: GOTO 60164
LET TS% = T%:T25 = TY5: GOTO 60164
60174
60175
60176
         REM FOUND AT ELEMENT T

REM FOUND AT T - SEND PHONETIC EQUIVALENT

LET T6 = TP6(T): GOSUB 60181
60177
60178
60179
         LET T1$ = "": GOTO 60159
60180
         60181
         REM * OUTPUT T$
REM * TO SYNTHESIZER
60182
60183
         REM ***********
60184
60185
         LET T'S = T'S + " ": IF TG THEN GOSUB 60226: IF RND (1) > .7
 THEN
         GOSUB 60214
         FOR T3 = 1 TO LEN (T5)
60186
         POKE 49361, ASC ( MID$ (T$,T3,1)): POKE 49364,0: REM SEND T
60187
O OUTPUT PORT
60188
         NEXT T3
IF TG THEN GOSUB 60234
60189
         RETURN
60190
60191
60192
         REM ************
         REM *
                  DRAW LORES FACE
60193
         REM **********
60194
60195
          REM MAIN FACE
         CR : POKE - 16302,0: REM FULL SCREEN GRAFHICS
FOR T2 = 40 TO 47: HLIN 0,39 AT T2: NEXT T2
COLOR= 8: HLIN 9,30 AT 0: COLOR= 7
FOR T2 = 1 TO 39: HLIN 9,30 AT T2: NEXT T2
60196
60197
60198
60199
          VLIN 2,37 AT 8: VLIN 2,37 AT 31
60200
         VLIN 4,35 AT 7: VLIN 4,35 AT 32
VLIN 8,33 AT 6: VLIN 8,33 AT 33
60201
60202
          VLIN 13,32 AT 5: VLIN 13,32 AT 34
60203
          VLIN 18,26 AT 4: VLIN 18,26 AT 35
60204
60205
          HLIN 9,30 AT 40: HLIN 10,29 AT 41
         HLIN 10,29 AT 42: HLIN 11,28 AT 43
HLIN 12,27 AT 44: HLIN 13,26 AT 45
HLIN 14,25 AT 46: HLIN 15,24 AT 47
60206
60207
60208
                FACIAL FEATURES
60209
          REM
          COLOR= 10
                        VLIN 23,33 AT 19: VLIN 23,33 AT 20
60210
         COLOR= 3: VLIN 30,32 AT 18: VLIN 30,32 AT 21
COLOR= 8: PLOT 18,33: PLOT 21,33
60211
60212
         HLIN 10,15 AT 16: HLIN 24,29 AT 16: GOSUB 60234 REM EYES
60213
60214
60215
         COLOR= 7: FOR T4 =
                                    19 TO 21
          HLIN 11,14 AT T4: HLIN 25,28 AT T4: NEXT T4
60216
         LET TH% = RND (1) * 5:TV% = RND (1) * 2: COLOR = 0
FOR T4 = 10 TO 11: FOR T5 = 19 TO 20
PLOT T4 + TH%, T5 + TV%: PLOT T4 + 14 + TH%, T5 + TV%: NEXT T5
60217
60218
60219
.T4
60220
         COLOR= 3: HLIN 11,14 AT 18 + TV%: HLIN 25,28 AT 18 + TV% COLOR= 8: HLIN 10,15 AT 18: HLIN 24,29 AT 18
60221
         HLIN 10,15 AT 22: HLIN 24,29 AT 22
VLIN 19,21 AT 10: VLIN 19,21 AT 15
VLIN 19,21 AT 24: VLIN 19,21 AT 29
60222
60223
60224
60225
          RETURN
60226
          REM MOUTH OPEN
         COLOR= 10: HLIN 16,23 AT 37: HLIN 17,22 AT 40
COLOR= 8: PLOT 14,37: PLOT 25,37
COLOR= 3: PLOT 13,36: PLOT 26,36
60227
60228
60229
60230
         COLOR= 0: HLIN 15,24 AT 38
60231
         HLIN 16,17 AT 39: HLIN 22,23 AT 39
60232
         COLOR= 8: HLIN 18,21 AT 39
60233
         RETURN
         REM MOUTH CLOSE
60234
         COLOR= 7: HLIN 15,24 AT 39: HLIN 15,24 AT 40
COLOR= 10: HLIN 16,23 AT 37: HLIN 17,22 AT 3
60235
                        HLIN 16,23 AT 37: HLIN 17,22 AT 39
60236
60237
         COLOR= 8: PLOT 14,37
60238
          COLOR= 3: PLOT 13,36: PLOT 26,36
         COLOR= 0: HLIN 16,17 AT 38: HLIN 22,23 AT 38 COLOR= 8: HLIN 18,21 AT 38
60239
60240
60241
```

### We Blench All Prices ! PACKARD HP-85 HP-125 \$1989 Your Choice NEW HP-87.... CALL 5¼" Dual Master Disk Drive . . . . . . CALL 8" Dual Master Disk Drive..... CALL 5meg WINCHESTER Hard Disk . . . . . . \$3599 5meg WIN. w/51/4 DSDD floppy . . . . . . . \$4399 APPLE II PLUS, 48K CALL CALL TI 99/4 . . . . COMMODORE VIC-20 ..... \$255 YEROX 820 5¼" Disk Drives . . . . . . . \$2489 XEROX 820 8" Disk Drives ...... \$3095 TI CALCULATORS TIP-58C......\$79 \$169 TIP-P-100C..... \$149 DETERMINE ICVI HP-41CV w/Five times more memory Built In List, \$325 \$189 HP-41C list, \$250 \$244 NOW IN STOCK HP-41CV Printer ...... \$289.00 HP82160A HP-IL Module . . . . . . . . . . . \$99.00 HP82161A Digital Cassette Drive . . . \$449.00 \$689 ATARI®800 \*Limited time only ATARI 400 -NEW LOW PRICE ATARI 400 \$339 ersonal omputer ystems P.O. Box 1073 Syracuse, N.Y. 13201 (315) 478-6800 Prices do not include shipping bt UPS. All prices and offers are subject to change without notice



Rediscover the *fun* of driving, in this genuine replica of the '52 MG-TD. Detailed, authentic, this sporty roadster gives you all the pleasure of a classic sportscar — with easy maintenance and reliability, too! Easy-to-assemble kit comes complete with everything you need to build the car at home in your leisure time, over a VW chassis and engine. Factory-built models also available. Fuel efficient, economical, and beautiful: you'll enjoy

building it now, and driving it for years. Why long for the "good old days" — they're here now! Call toll-free for complete information:

1-800-328-5671\*

\*In Minnesota, [612] 544-2781. International TWX: 910-576-3150. Or write for complete brochures: send \$3.00 with your name, address, telephone number and the name of this publication, to Fiberfab, 1000 Turners Cross Rd., Minneapolis, MN 55416. Specify information on the MG-TD Replica.





### 68000 MINI-SYSTEMS

IEEE-696 S-100 Compatible

### Special Offer

ERG-I \$7995 — CPU, 4 RS232 SERIAL PORTS, 64K STATIC RAM, 10 SLOT BACK PLANE, 2 8" DOUBLE DENSITY, DOUBLE SIDED FLOPPIES OR A 5MB 51/4" WINCHESTER, 68KFORTH1 SYSTEMS LANGUAGE WITH MACRO ASSEMBLER, ALL INTEGRATED INTO DESK TOP CABINET, BURNED-IN AND TESTED.

**ERG-II \$9795** — SAME AS ERG-I EXCEPT FOR MASS STORAGE; ERG-II HAS A 5MB 5¼" WINCHESTER AND ONE 8" DOUBLE DENSITY, DOUBLE SIDED DRIVE.

ERG-III \$12995 — CPU, 4 RS232 SERIAL PORTS, 256K DYNAMIC RAM, 10 SLOT BACK PLANE, 5MB 5¼" WINCHESTER AND ONE 8" DOUBLE DENSITY, DOUBLE SIDED DRIVE, IDRIS<sup>2</sup> MULTI-USER, MULTI-TASKING OPERATING SYSTEM AND C COMPILER, ALL INTEGRATED INTO DESK TOP CABINET, BURNED-IN AND TESTED.

ERG-IV \$18995 — CPU, 8 RS232 SERIAL PORTS, 512K DYNAMIC RAM, 10 SLOT BACK PLANE, 24MB 8" WINCHESTER AND 20 MB ¼" TAPE CARTRIDGE, IDRIS² MULTI-USER, MULTI-TASKING OPERATING SYSTEM WITH BOTH C AND PASCAL COMPILERS, ALL INTEGRATED INTO DESK TOP CABINET, BURNED-IN AND TESTED.

8MHz CPU Standard, 10MHz Optional; OEM Pricing for CPU, Card Sets and Integrated Systems Available.

Trademark | ERG; 2 WHITESMITHS LTD.

30 Day Delivery for Integrated Systems with valid purchase order

United Kingdom MicroAPL LTD. London 834-2687 EMPIRICAL RESEARCH GROUP, INC. POB 1176

MILTON, WA 98354 206-631-4855 Australia/New Zealand S.I. MicroComputer Prod. LTD. Sydney 231-4091 The INITIALIZATION section dimensions the WORD and PHONEME arrays to hold 300 entries each. This situation can be modified, of course, to suit your needs. In addition, the string variable D\$ is initialized by setting it equal to control-D for use in disk operation of the Apple. (This step would be omitted for such computers as the TRS-80.)

The MENU section allows easy selection of the desired function when developing a vocabulary. The GET statement permits you to enter data from the keyboard without using the Return key.

The two DISK modules save and retrieve the two arrays that contain the vocabulary. Two variables are particularly important if you are converting this program for use on another computer. The number of words in the dictionary, and thus the number of entries in each array, is the first number in the disk file. It is read into the variable TA, and it controls the number of words that are subsequently read into each array. The variable TN\$ holds the name of the disk file: this allows you to use several dictionaries. Dictionaries can also be loaded and saved to other disks when required.

The section for PREPARING A NEW WORD allows you to easily develop the proper sounds for a new dictionary entry.

Any character or group of characters will be "said" by the synthesizer when the Return key is hit. The last sound is continually voiced, so each word should be followed by a space. This "problem" is actually a design feature. When developing a word, you can listen to each sound by typing its character and hitting Return with no space. This feature is indispensable when comparing different phonemes.

When the word is finally correct, hit Return with no entry, and you will be asked if you wish to save that sound. If you do, you will also be asked to supply a word that demonstrates the sound. Both the word and its sound will be automatically entered into the dictionary in alphabetical order. The importance of this will become apparent in a moment.

If you convert this program to another BASIC, lines 60095 to 60098 could present problems. These lines utilize a subroutine in the Apple's monitor that enters characters into the buffer area. A simple INPUT TS\$ could have been used, but my method allows you to enter such illegal characters as semicolons and quotes. In addition, it preserves all of the Apple editing features.

The LIST DICTIONARY allows you to dump all the present words and their sound codes to the screen (or a printer). The listing scrolls a new screen full each time a key is pressed. ESC will abort the listing and return to the MENU.

The section SAY A SENTENCE is used to say the words contained in T\$. It may be used as a separate subroutine if it is entered at line 60150. which only says TS\$, without entering it from the keyboard. This module performs a binary search of the words in the dictionary and outputs the appropriate sound to the synthesizer.

By using a binary search of the dictionary, conversion is done very quickly. For example, 256 words can be examined with only eight reads. This is possible because the words are organized in alphabetical order and the program divides the remaining words in half with each successive guess.

If the word is not found in the dictionary, it (not its phonemes) is sent to the synthesizer. Such words are, at best, poorly pronounced, but at least the system does not crash in the middle of a big demonstration. In most cases you'll find that one bad word is easily recognized in the context of a complete sentence.

The FRE(0) function in lines 60085 and 60155 forces an internal clean-up of the Applesoft string variables. This operation can require several seconds, depending on the length of the dictionary. When utilizing subroutines from this system in other programs, FRE(0) can be postponed until several sentences have been voiced. This will allow pauses at the most natural points.

Section OUTPUT T\$ sends the phoneme code of each individual



### BUSINESS SOFTWARE YOU CAN SELL WITH NO ROYALTIES!

Vandata has an incredible deal for dealers, OEMs and mature users. Buy the complete Vandata business software package for a low \$295, and then resell it as often as you wish to end users without paying royalties.

This is the best-debugged, easiest-to-install, enhanced Osborne-based system on the market. The industry standard accounting package with thousands of users, It's well worth up to \$995 to end users.

You'll receive both source and object code for General Ledger, Accounts Receivable, Accounts Poyable and Payroll & Cost Accounting, Plus, our custom installation program that tailors the system to most terminals and disks.

Minimum requirements are 48K RAM, CP/M™ or CDOS, CBASIC2,™ a CRT, and a 132-column printer. Vandata can provide standard 8", NorthStar 5" double-density or Hearth/Zenith 5" diskettes. Our installation manual is included and the Osborne/McGraw-Hill application manuals are available separately.

17544 Midvale Ave. N., Suite 205, Seattle, WA 98133. (206) 542-7611



Brings to CP/M Some of the BEST FEATURES of UNIX!

(MMMM)

The... POWER of UNIX POPULARITY OF CP/M

Available for adoption by: CP/M SOFTWARE DEVELOPERS CP/M SOFTWARE USERS

CP/M Compatibility	Loads and Executes as a normal program under CP/M, installing itself under the CP/M operating system. Other CP/M programs - editors/word processors/application programs/compilers/ assemblers - may then be run using all MicroShell features.  CP/M compatibility is generally not affected by MicroShell's presence. Adds UNIX Power without losing CP/M Compatibility.
Console Input/Output Redirection	Send Console Output to a File instead of or in addition to the screen Example: stat "." > status - sends "stat" output to file "status" Take Console Input from a File instead of the Keyboard Example: ed filename < script - takes "ed" commands from the file "script" Indispensable for: graphic debugging, saving exact Screen Output for documentation, etc.
Automatic Command File Search Path	MicroShell finds your program. User concentrates on the big tasks, MicroShell does the details     Per mits development or data files on one drive and all programs on another     User-specified file types for Automatic Search, Example: "com", "Int", etc.     User-specified Search Path, Example: Current Drive 1st, then Drive A, etc.
Multiple Commands Per Line	User types a logical group of commands to be executed     Example: compile file, link file, file     MicroShell executes the commands one at a time
Direct Command File Execution	Files of CP/M or MicroShell commands are executed by MicroShell simply by typing file name     User-specified Command Filetypes. Example: ".sh", ".sub", etc.     Argument substitution (\$1, \$2, etc.) as with CP/M SUBMIT/XSUB
Additional Features	User definable prompt with Disk Drive and/or User Number optional     Install program to customize MicroShell to user's needs & system     Others - ORDER MANUAL FOR FULL DETAILS

CP/M 2 2/32K with 8080/808

ADOPTION FEE: Manual Only:

\$150.00 \$ 25.00

(VA residents add 4% sales tax) VISA, MC, Check or Money Order NEW GENERATION SYSTEMS, inc.

Mail or Phone Adoption Requests to: 2153 Golf Course Drive Reston, VA 22091 (703) 476-9143

CP/M - TM of Digital Research C UNIX - TM of Bell Telephone Lab

# "RAIR" AND WELLDONE!

The Rair family of computers combine high performance features for a fraction of what you would expect to pay.

Rair's Black Box Micro Computers were designed with all the features that today's users want most.

Desk-top design requires no special environment. "Black Box" architecture allows computer systems to be configured for the widest range of computing applications. Black Box systems are supported by common development software allowing total program portability across the entire range. Drake Microsystems puts it all together. A complete line of hardware and software, and the know-how to make it work.



2777 Orchard Run Rd. West Carrollton, Ohio 45449

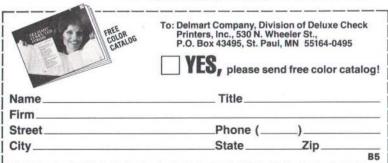
(513) 435-2283



### Carbonless checks, invoices and statements

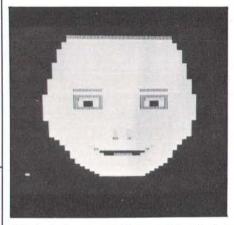
- \* Standard formats...plus Custom Design Service!
- ★ Small quantities (as low as 500)...plus money-saving prices!
- Super-fast service (shipped 5 days after receipt of order!)

SEND COUPON...OR CALL TOLL-FREE: 1-800-328-9697.



word to the synthesizer. My program sends it to a port at address 49361 and strobes it in by writing to address 49364. On a TRS-80 you would only need to print T\$ into the last 32 screen locations. The example programs provided in the synthesizer manual should aid in converting this module for use with a TRS-80.

One peculiarity of operating the system should be mentioned. Sending a "?" to the synthesizer will toggle it on or off depending on its present state. Since Reset does not turn the synthesizer on, you may or may not have to send a "?" to initially activate it.



**Photo 3:** Low-resolution graphics display adds life to the speech program.

As an afterthought, I decided to add a little spice to the program. The final module (draw a low-resolution face) produces the graphics shown in photo 3. Such an addition would have to be greatly modified if run on a TRS-80, but I heartily recommend it. The mouth opens and closes with each word and the eyes (complete with eyelids) move at random. I can't tell you the reaction a talking face gets from a person not used to working with computers.

I'm extremely happy with the addition of voice output to my personal computer, and it has inspired several applications that may be discussed in future articles. If you want your machine to talk, compare the phonetics approach with other methods. If it meets your requirements, I hope that my speech-development system will make your life easier.

# **Technical Forum**

# Hierarchical Interrupts

Caxton C. Foster
Computer and Information Science
University of Massachusetts
Amherst. MA 01003

Most popular microprocessors will support daisy-chained peripheral devices. These allow a peripheral close to the processor to gain priority over a more distant peripheral when both devices request interrupt service simultaneously. This is normally done by using two lines between the processor and its set of peripheral devices (see figure 1). The first line is the IRQ (interrupt-request line). Any device is allowed to "pull" this line to ground, thus generating a request for interrupt service. At the convenience of the processor, the second line (the interrupt-acknowledge line or INTACK) is energized, indicating that the processor is ready to accept an interrupt.

The INTACK line goes sequentially from device to device, thus giving rise to the term "daisy chain." If a device isn't requesting an interrupt, it passes the unchanged INTACK signal to its successor in the chain. If, however, a device is in the active state and is requesting an interrupt, it "traps" the acknowledge signal. Since devices farther down the line never receive the acknowledge signal, they don't take control of the processor or the system bus.

In any imaginable interrupt system, if devices A and B request interrupts simultaneously, either A wins or B wins (ties are not permitted). We have, in effect, a strict ordering of all the peripheral devices by priority. Adding

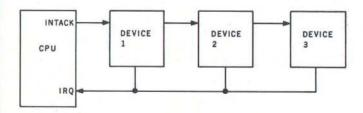


Figure 1: Daisy-chain connection of interrupting peripherals. If two peripheral devices interrupt simultaneously, the device closer to the computer takes priority over the one farther away. This system allows a higher-priority device to interrupt a lowerpriority device.

a hierarchical level mechanism merely gives the device at level n priority over the devices on level n-1 or lower. In this sense, a daisy chain is a general solution to the problem of resolving simultaneous requests.

Unlike a daisy chain, a hierarchical scheme keeps lowpriority devices from interrupting the code processing the interrupt of a high-priority device. In a typical hierarchical scheme, the processor has a level at which it is currently running. Each peripheral device requests an interrupt on one of several lines: IRO0, IRO1 . . . IROn where n is commonly 3 or 7 (see figure 2). A priority encoder examines these request lines and outputs a binary number corresponding to the number of the highest active request line. This binary number is compared with the processor's current level and, if the level of the processor is greater than or equal to the level of the request, the request is not acted upon and no new interrupt is generated. Only if the request level exceeds the processor level will the current program be interrupted. If an interrupt is to be honored, the interrupt-acknowledge line (IN-TACKO, INTACK1 . . . INTACKn) corresponding to the level of the highest request is activated.

Three difficulties accompany the hierarchical-interrupt scheme. Foremost is the fact that many otherwise attractive microprocessors don't have one. Second, microprocessors that *do* incorporate such a scheme usually have too many levels (causing some hardware to go unused) or too few (almost as difficult as none at all). Third, for *n* levels, *2n* lines must be added to the I/O (input/output) bus to convey requests and acknowledgments.

### The Present Method

In a daisy chain, each peripheral device has an interrupt flag that has two states: on and off. To turn the processor's interrupt system back on (so that other, more important interrupts can be recognized), this initial interrupt flag must be cleared (thus releasing the IRQ line)

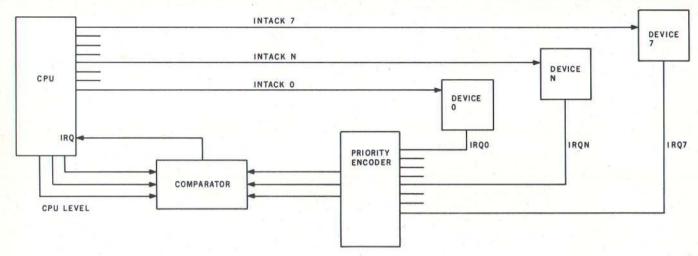


Figure 2: A typical hierarchical-interrupt scheme. The processor keeps track of the interrupt level it's currently servicing and will pause to give service only if an interrupt occurs at a higher level.

soon after its recognition. If this is not done and all interrupts are serviced with the interrupt system disabled, the intended hierarchy becomes a first-come-first-served system.

Peripheral devices could be equipped with a three-state interrupt flag:

Off—not requesting service (does not affect IRQ); passes INTACK down the chain (away from the processor) and passes IRQ up the chain (toward the processor).

On—requesting service (asserts IRQ); does not pass INTACK down line but traps it instead.

Blocking—not requesting service; does not pass IRO up the chain.

States Off and On correspond to the two conventional states. In the Blocking state, the device refuses to allow lower-priority devices (those farther down the chain) to break into its interrupt-service routine, thus protecting its own priority and incidentally providing a hierarchy with as many levels as there are peripheral devices. When a device needs service, it changes from Off to On. At the first clear-interrupt flag (issued by the processor prior to reenabling the interrupt system), the device changes its state from On to Blocking. This releases the IRQ line and also prevents lower-priority devices from pulling it down. At the second clear-interrupt flag (issued by the processor at the end of the interrupt routine), the device changes from Blocking to Off.

Clearly a paragon of interrupt systems, it allows each device to protect its own service routine from all lesser requests. The system allows infinitely fine discrimination, with classes of devices having one member each.

### A Less Expensive Realization

The system described above requires an additional flipflop and a few additional gates at each peripheral device. If this configuration is too expensive, it's possible to envision an intermediate system.

Into the daisy chain we insert a few *blocking nodes* (see figure 3). To the processor, these look like normal peripheral devices with a peripheral address. They are capable of executing two operations: Block and Unblock. In the Unblock state these special nodes are transparent and have no effect on the daisy chain, but in the Block state they inhibit any interrupt requests from devices beyond them in the chain.

After recognizing an interrupt and before reenabling the interrupt system, the processor issues a Block command to the node just inboard of the active peripheral. At the conclusion of the service routine, the processor Unblocks the node and allows all peripheral devices an opportunity to compete for attention.

If the processor had one more output line (the Unblock line), we could dispense with the addresses for these nodes. On interrupt request, the nearest inboard node could set itself automatically to the Block state and forward the interrupt request to the processor. At the conclusion of an interrupt-service routine, the processor could issue an Unblock command on the Unblock line, and the Blocked node nearest the processor could reset itself.

### Conclusion

Either of these solutions would provide a moderatecost, reasonably flexible means of keeping low-priority devices from interrupting high-priority service routines. To be sure, the priority of a device would depend on its position in the daisy chain. Not only would it be a considerable nuisance to rearrange the priorities, but it would, in fact, be impossible to accomplish without operator assistance.

Using memory-mapped I/O with PIAs (peripheral interface adapters) or VIAs (versatile interface adapters) is a more flexible solution than either proposed here,

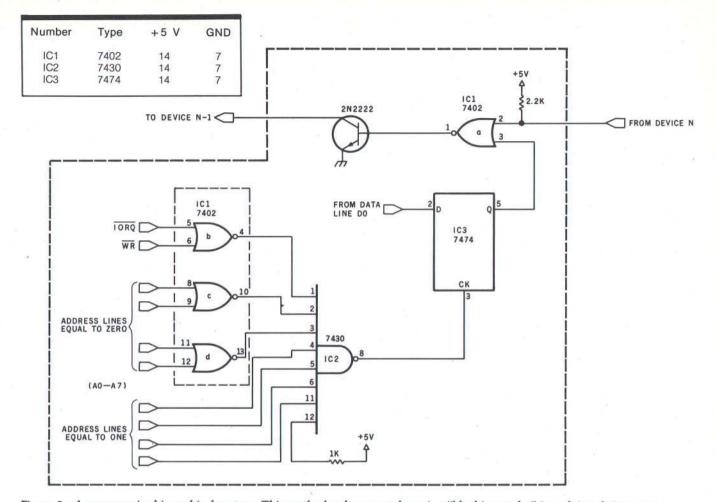


Figure 3: A compromise hierarchical system. This method reduces cost by using "blocking nodes" in a daisy-chain system.

because an arbitrary priority hierarchy can be constructed that doesn't even need to be transitive (A can block B and C, B can block C, and C can block A and B). The mask bits in the VIA permit and block interrupts from devices in any fashion that seems acceptable to the

system at a particular time. For a system organized on an I/O bus, however, either of the schemes proposed here offers a great improvement over the simple interrupt armed or interrupt disarmed that have been the usual implementations to date.

### JAY WEINBERG: LIVING PROOF YOUR CONTRIBUTIONS COUNT.

These days, Jay Weinberg's most difficult battles take place on the tennis court. Five years ago, he had a different kind of fight on his hands: against one of the toughest forms of cancer.

Cancer research and treatment have made Jay's kind of recovery possible for almost 2 million people. Which means that your donations have helped buy Jay Weinberg a very beautiful gift: his life.

CANCER CAN BE BEAT.

American Cancer Society

# **Books Received**

Apple II/III Software Directory, G. Van Diver and R. Love. Overland Park, KS: Vital Information Inc. (7899 Mastin Dr.), 1982; 1148 pages, 13 by 20.5 cm, softcover, ISBN none, \$19.95.

Assembly Language for the PDP-11, Charles Kapps and Robert L. Starford. Boston, MA: CBI Publishing Company, 1981; 353 pages, 17.5 by 23.5 cm, hardcover, ISBN 0-87150-304-2, \$23.50.

BASIC Programs for Home Financial Management, W. B. Goldsmith Jr. Englewood Cliffs, NJ: Prentice-Hall, 1981; 314 pages, 21.5 by 28 cm, hardcover, ISBN 0-13-066522-3, \$18.95.

BASIC Programs for Scientists and Engineers, Alan R. Miller. Berkeley, CA: Sybex, 1981; 318 pages, 17.5 by 23.5

cm, softcover, ISBN 0-89588-073-3, \$14.95.

A Bibliography of Computer Music, Sandra L. Tjepkema. Iowa City, IA: University of Iowa Press, 1981; 276 pages, 15 by 23 cm, hardcover, ISBN 0-87745-110-9, \$17.50.

CAI Sourcebook, Robert L. Burke. Englewood Cliffs, NJ: Prentice-Hall, 1982; 206 pages, 15 by 23 cm, hard-cover, ISBN 0-13-110155-2, \$14.95.

Computers for People, Jerry Willis and Merl Miller. Beaverton, OR: Dilithium Press, 1982; 200 pages, 13 by 21 cm, softcover, ISBN 0-918398-64-9, \$7.95.

Computer Simulation of Classical Substitution Cryptographic Systems, Rudolph F. Lauer. Laguna Hills, CA: Aegean Park Press, 1981; 111 pages, 21.2 by 27.2 cm, soft-cover, ISBN 0-89412-050-6, \$24.80.

Database Management System Anatomy, James A. Larson. Lexington, MA: Lexington Books, 1982; 183 pages, 15.5 by 22.5 cm, hardcover, ISBN 0-669-04544-6, \$22.95.

Databook of Venture Capital Sources for High-Technology Companies, Richard Loftin. Washington, DC: Financial Data Corporation, 1981; 576 pages, 14.5 by 22.3 cm, softcover, ISBN 0-940758-00-8, \$115.

The 8085/SDK-85 [Hands-On, Volume 2], Howard Boyet. New York: MTI Publications, 1981; 814 pages, 15.5 by 23 cm, softcover, ISBN none, \$19.95.

The 8051: Programming, Interfacing, Applications, Howard Boyet and Ron Katz. New York: MTI Publications, 1982; 396 pages, 17 by 25.2 cm, softcover, ISBN none, \$19.95.

Experiments in Electronics, Instrumentation, and Microcomputers, F. Holler, J. Avery, S. Crouch, and C. Enke. Menlo Park, CA: The Benjamin/Cummings Publishing Co., 1982; 326 pages, 21.2 by 27.2 cm, softcover, ISBN 0-8053-6918-X, \$13.95.

From Chips to Systems: An Introduction to Microprocessors, Rodnay Zaks. Berkeley, CA: Sybex, 1982; 552 pages, 17.5 by 23.5 cm, softcover, ISBN 0-8988-063-6, \$14.95.

H-8 Programming for Beginners, Ron Santore, Don





Computer Shopper is your link to individuals who buy, sell and trade computer equipment and software among themselves nationwide. No other magazine fills this void in the marketplace chain.

Thousands of cost-conscious computer enthusiasts save by shopping in Computer Shopper every month through hundreds of classified ads. And new equipment advertisers offer some of the lowest prices in the nation.

Computer Shopper's unbiased articles make for some unique reading among magazines and there's a "help" column to answer difficult problems you may have with interfacing, etc.

For a limited time you can subscribe to Computer Shopper with a six month trial for only \$6.

6 month trial, \$600 Call Toll Free MC & 800-327-9920



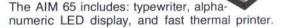
or send a check to:

COMPUTER SHOPPER

P.O. Box F301 • Titusville, FL 32780 305-269-3211

# AIM for Control

For process control or industrial development systems, put Rockwell's AIM 65 to work for you. Use off-the-shelf AIM-Mate Series and STD BUS expansion products to configure the system you need.



Plug-in options include: memory (to 48K), ROM languages, parity protection, video display, floppy disk storage, STD BUS expansion cage, TTL and real world interfaces, and complete system software.

Call or write for complete AIM-Mate Series information.



87070 Dukhobar Road, Eugene, Oregon 97402 (503) 485-8575

Inman, and Bob Albrecht. Portland, OR: Dilithium Press, 1980; 195 pages, 13 by 20.5 cm, softcover, ISBN 0-918398-17-7, \$8.95.

Information Systems Development, A Systematic Approach, Mats Lundeberg, Göran Goldkuhl, and Anders Nilsson. Englewood Cliffs, NJ: Prentice-Hall, 1981; 337 pages, 17.5 by 23.5 cm, hardcover. ISBN 0-13-464677-0. \$24.95.

Introduction to Interactive Computer Graphics, Joan E. Scott. New York: John Wiley & Sons, 1982; 255 pages, 14.6 by 22.3 cm, hardcover, ISBN 0-471-05773-8, \$24.95.

Introduction to Real-Time Software Design, S. T. Allworth. New York: Springer-Verlag, 1981; 140 pages, 14.6 by 22.3 cm, softcover, ISBN 0-387-91175-8,

Inventory Management for Small Computers, Chuck Atkinson. Beaverton, OR: Dilithium Press, 1982; 194 pages, 13 by 20.5 cm, softcover, ISBN 0-918398-48-7, \$16.95.

Minds and Mechanisms, Margaret A. Boden. Ithaca, NY: Cornell University Press, 1981; 311 pages, 13.5 by 22 cm, hardcover, ISBN 0-8014-1431-8, \$29.50.

Oh! Pascal!, Doug Cooper and Michael Clancy. New York: W. W. Norton & Company, 1982; 476 pages, 17.5 by 23.5 cm, softcover, ISBN 0-393-95205-3, \$15.95.

Pascal: A Problem Solving Approach, Elliot B. Koffman. Reading, MA: Addison-Wesley, 1982; 470 pages, 15.5 by 22.5 cm, softcover, ISBN 0-201-10341-9, \$14.95.

PET Fun and Games, Ron Jeffries and Glen Fisher. Berkeley, CA: Osborne/ McGraw-Hill, 1981; 192 pages, 21.2 by 27.2 cm, softcover, ISBN 0-931988-70-5 \$10.

Practical Data Base Management, edited by the Auerbach Publishers Staff. Reston, VA: Reston Publishing Company, 1981; 430 pages, 14.6 by 22.3 cm, hardcover, ISBN 0-8359-5591-5, \$24.95

Robot Manipulators, Mathematics, Programming, and Control, Richard P. Paul. Cambridge, MA: The MIT Press, 1981; 279 pages, 15 by 23 cm, hardcover, ISBN 0-262-16082-X, \$25.

Simple Pascal, James J. McGregor and Alan H. Watt. Rockville, MD: Computer Science Press, 1981; 182 pages, 15 by 22 cm, softcover, ISBN 0-914894-72-2, \$10.95.

Strategic Financial Planning with Simulation, Dennis E. Grawoig and Charles L. Hubbard, Princeton, NI: Petrocelli Books, 1982; 643 pages, 14.6 by 22.3 cm, hardcover. ISBN 0-89433-115-9,

Trends in Information Processing Systems (Proceedings of the Third Conference of the European Cooperation in Informatics, Munich, October 20-23, 1981), volume in the Lecture Notes in Computer Science series, edited by G. Goos and J. Hartmanis. New York: Springer-Verlag, 1981; 349 pages, 16 by 23.8 cm, softcover, ISBN 3-540-10885-8, \$20.

A User Guide to the Unix System, Jean Yates and Rebecca Thomas. Berkeley, CA: Osborne/McGraw-Hill, 1982; 496 pages, 7.4 by 9 cm,

softcover, ISBN 0-931988-71-3, \$15.99.

Writing Interactive Compilers and Interpreters, P. J. Brown. New York: John Wiley & Sons, 1981; 265 pages, 14.6 by 22.3 cm, softcover, ISBN 0-471-10072-2, \$14.50.

This is a list of books received at BYTE Publications during this past month. Although the list is not meant to be exhaustive, its purpose is to acquaint BYTE readers with recently published titles in computer science and related fields. We regret that we cannot review or comment on all the books we receive; instead, this list is meant to be a monthly acknowledgment of these books and the publishers who sent them.

### ${\mathcal B} \, Y \, T \, E \, W \, R \, I \, T \, E \, R$

### DAISY WHEEL PRINTER

LETTER QUALITY PRINTER AND TYPEWRITER IN ONE PACKAGE

The BYTEWRITER is a new Olivetti Praxis 30 electronic typewriter with a micro-processor controlled driver added internally.



**\$795** 

plus shipping

Dealer Inquiries Invited

- Underlining 10, 12, or 15 characters per inch switch selectable 2nd keyboard with foreign grammar symbols switch selectable • Changeable type daisy wheel • Centronics-compatible parallel input operates with TRS-80, Apple, Osborne, IBM
- and others Cartridge ribbon Typewriter operation with nothing to disconnect Service from any Olivetti dealer Self test program built in.

### BYTEWRITER

125 NORTHVIEW RD., ITHACA, N.Y. 14850 (607) 272-1132

> Praxis 30 is a trademark of Olivetti Corp. TRS-80 is a trademark of Tandy Corp.
> BYTEWRITER is a trademark of Williams Laboratories.

# **Clubs and Newsletters**

### **Hobbyists Compute** Under the Big Sky

The Big Sky Micro-Computer Club currently has about 35 members. All types of computers are of interest to the club. Beginners and experts alike are invited to join and help with the newsletter. Contact the Big Sky Micro-Computer Club, POB 21456, Pioneer Station, Billings, MT 59102, or call Wes Henley at (406) 656-4013.

### **Personal Computer Group In Capital**

IBMicro is a new group for IBM Personal Computer users in the Washington, DC, area. The club has created a charter and bylaws and is busily at

work on a newsletter, a bulletin board, and hardware and software exchanges. The group plans to have monthly meetings with guests speakers and feedback from members. Special-interest groups for word processing, graphics, games, and other applications are planned. Contact IBMicro, 1414-C Wright Circle, Bolling AFB, Washington, DC 20336.

### Nevada COBOL **Users Group**

The Nevada COBOL Users Group has been formed to distribute information on applications and routines written in the language. The club will provide coordination among users developing extensions to Nevada COBOL. Information will be distributed through periodic newsletters. Contact Bob Blum, Nevada COBOL Users Group, 5536 Colbert Trail, Norcross, GA 30092, (404) 449-8948.

### Starter Kit Group

Cary Davids has started a users group for owners of the Z80 Starter Kit from SD Systems. The club produces a newsletter. Contact Carv Davids, 6000 Puffer Rd., Downers Grove, IL 60516.

### Osborne Group Assembling

A new group for Osborne Computer users is being formed in the Tampa Bay area. For further details, contact Frederick Dunn, POB 517, Clearwater, FL 33517, (817) 446-7239.

### South American **Hobbyists**

The Concepción Computer Club is interested in all areas of microcomputing. The club would appreciate information and newsletters from other users groups. A special edition of the group's newsletter, Boletín del Concepción Computer Club, is produced in English. Contact Raúl H. Figueroa Rebolledo, Concepción Computer Club, POB 685, Concepción, Chile, Tel: 24854.

### 6800/6809 Fans In Sweden

PD 68 is a group of Motorola 6800 and 6809 users in Sweden. The group meets on the last Thursday of each month, excluding June, July, and December, at ABF Huset, Hammarby Centrum, in Stockholm. The Flex operating system is of particular interest to group members, who number about 300. A newsletter, MPU-laren, is produced each quarter. The club would like to hear from the personalcomputing community in the U.S. Contact Jason King, Ludwigsbergsgatan 131, S-117 26, Stockholm, Sweden, Tel: 08/68 23 11.

### **New Address**

The new mailing address for the Amateur Computer Group of New Jersey (ACG-NJ) is POB 319, South Bound Brook, NJ 08880.

### **Explorer 85 Users** Group

A new group is being formed for owners of Netronics' Explorer 85 system. The group plans to produce a free newsletter of hardware and software ideas. For more information, contact Gord Wiggins, POB 88, Cartwright, Newfoundland, A0K 1V0, Canada.

### **Graphics Club** Forming

A computer graphics club is being formed in the Connecticut/Westchester County, New York area. Plans call for group meetings with manufacturers of graphics products and creating a newsletter. For further details, contact Howard Rothman, 218 Huntington Rd., Bridgeport, CT 06608. (203) 579-0472.

### **ATTENTION S-100 USERS, OEMs & ISOs!** MM-103 IS THE ONLY MODEM

FOR YOUR NEEDS!

In previous issues, we listed more than 50 reasons why PMMI MM-103 modems are superior, along with a list of satisfied users that is now too long to print. Quality, integrity and low cost have made the MM-103 America's most popular modem.

PMMI was the first to gain FCC approval and meet IEEE-696 S-100 standards. You won't find another modem for the S-100 bus with a wider range of Baud rates, more extensive and controllable software and such an unbeatable warranty And since PMMI has eliminated the need for an acoustic coupler or an RS 232 adapter. your connection is more reliable and you buy no unnecessary hardware.

### SO DON'T DELAY!

GO WITH THE MODEM WITH EXPERIENCE!



### COMMUNICATIONS

[POTOMAC MICRO-MAGIC, INC.]

For further information, call or write:

Three Skyline Place 5201 Leesburg Pike, Suite 604 Falls Church, VA 22041 [703] 379-9660

Or dial into our 24 hour-a-day Modem Test Center [703] 379-0303 [300 Baud]

AFTER ALL **ALL MODEMS ARE NOT CREATED EQUAL!** 

# **Software Received**

Apple

AgDisk Financial Management Series One, an agricultural financial-management package in Pascal for the Apple II. Floppy disk, \$140. Harris Technical Systems, 624 Peach St., POB 80837, Lincoln, NE 68501.

Alkemstone, an adventuretype game for the Apple II. Floppy disk, \$39.95. Level-10, Suite 507, 7475 Dakin St., Denver, CO 80221.

Apple-Aids, a disk-utility package for the Apple II. Floppy disk, \$49.95. Advanced Operating Systems, 450 St. John Rd., Michigan City, IN 46360.

Beer Run, an arcade-type game for the Apple II. Floppy disk, \$29.95. Sirius Software Inc., 10364 Rockingham Dr., Sacramento, CA 95827.

Enhanced Graphics Software for the IDS 460G/560G, a graphics utility for the Apple II. Floppy disk, \$44.95. Computer Station Inc., 11610 Page Service Dr., St. Louis, MO 63141.

Graphic Writer, utility to combine graphics with Applewriter text for the Apple II. Floppy disk, \$34.95. Computer Station Inc. (see address above).

Hadron, an arcade-type game for the Apple II. Floppy disk, \$34.95. Sirius Software Inc. (see address above).

Hi-Res Computer Golf, a computerized golf game for the Apple II. Floppy disk, \$29.95. Avant-Garde Creations, POB 30160, Eugene, OR 97403.

The Liberator, a programming utility and library of subroutines for the Apple II. Floppy disk, \$29.95. Pear Software, 407 Terrace, Ashland, OR 97520.

Pascal Hi-Res Graphics Dump Routine for the IDS 460G, a graphics utility in Pascal for the Apple II.

Floppy disk, \$44.95. Computer Station Inc. (see address above).

Snake Byte, an arcade-type game for the Apple II. Floppy disk \$29.95. Sirius Software Inc. (see address above).

Sneakers, an arcade-type game for the Apple II. Floppy disk, \$29.95. Sirius Software Inc. (see address above).

Ultra Hi-Res Graphics, utility for use with the IDS 460G/560G printers with the Apple II. Floppy disk, \$49.95. Computer Station Inc. (see address above).

### Atari

Atari Word Processor, a word-processing system for the Atari 800. Floppy disk, \$149.95. Atari Inc., Computer Division, POB 427. Sunnyvale, CA 94086.

The Duplicating Machine, a program-duplication utility for the Atari 400 and 800. Floppy disk, \$19.95. Midwest Software, 2707A Ridge Court, Lawrence, KS 66044.

### CP/M

CP/M Adventures 1-12, a series of Scott Adams's adventures for CP/M (Z80). 8-inch floppy disk, \$129.95. Adventure International, 507 East St., POB 3435, Longwood, FL 32750.

Ficomp CP/M 2.2. Utilities, a set of utility programs for CP/M (Z80). 8-inch floppy disk, \$24.95. Ficomp Inc., 3017 Talking Rock Dr., Fairfax, VA 22031.

Copy86, a utility program for copying Z80 CP/M files to and from 86-DOS. 8-inch floppy disk, \$120. GIOS Enterprises, 9784 Woodhollow Way, Sacramento, CA 95827.

### PET

Concentration, Memory, Cosmic Collision, Hangman, and Torpedo Command, games for the PET 2001.

Cassette, \$5.99 each, Royal Software, 149-45 83rd St.. Howard Beach, NY 11414.

PET/CBM Cross-Reference Program, a crossreference utility program for the PET/CBM. Floppy disk, \$29.95. Oppenheimer Software, 79th Street Boat Basin #39, New York, NY 10024.

### **Texas Instruments**

Adventureland, an adventure-type game for the TI-99/4. Floppy disk, \$29.95. Texas Instruments Inc., 13500 North Central Expressway, POB 225012, Dallas, TX 75265.

Car Wars, an arcade-type game for the TI-99/4. Command Module (i.e., ROM cartridge), \$39.95. Texas Instruments Inc. (see address above).

The Count, an adventuretype game for the TI-99/4.

Floppy disk, \$29.95. Texas Instruments Inc. (see address above).

Ghost Town, an adventure-type game for the TI-99/4. Floppy disk. \$29.95. Texas Instruments Inc. (see address above).

Pirate Adventure, an adventure-type game for the TI-99/4. Floppy disk and Command Module (i.e., ROM cartridge), \$29.95. Texas Instruments Inc. (see address above).

Pyramid of Doom, an adventure-type game for the TI-99/4. Floppy disk, \$29.95. Texas Instruments Inc. (see address above).

### **TRS-80**

Bisplan, a businessmodeling program for the TRS-80 Models I and III. Cassette, \$20, Mariah Com-

Your FREE reference guide to

# **COMPUTER SUPPLIES**



Here's our latest edition yours FREE for the asking! This direct order catalog features 48 pages of more than 1000 supply products for your small business computer. Thousands of data processing managers nationwide buy their supplies direct from this catalog because they like the large selection, the ease of ordering, the fast delivery and the quality products. Plus, we've just introduced 100 new products to meet the demands of an everchanging computer vironment.

To receive your FREE 1982 catalog, simply call Toll-Free 800-323-0628 (in Illinois, call 312-377-0990) or circle the Reader Service Card number below.

Send for your free copy today!



A Subsidiary of Wallace Computer Services, Inc. 3626 Stern Drive I 1615 S. Stockton St. St. Charles, Illinois 60174 Lodi, CA 95241

### MAIL ORDER DISCOUNTS



SOFTWARE & ACCE	SSORIES
VISICALC	169
VISITREND/VISIPLOT	215
VISIFILE	210
DESKTOP PLAN II	159
BPI BUSINESS SOFTWARE	
CONTINENTAL BUS. SOFTWARE	215
SUPERSCRIBE II	110
SUPERTEXT II	105
EASYWRITER	219
WORDSTAR (CP/M)	299
REAL ESTATE ANALYZER	120
TAX PREPARER	85
CREATIVE FINANCING	120
HAYES MICROMODEM II	299
MICROSOFT Z-80 SOFTCARD	299
MICROSOFT 16K PAM CARD	160

VIDEX 80 COLUMN CARD
NEC NEC PC-8000
I TE
PC-8001A SYSTEM W/32K
PC-8012A I/O & EXPANSION
SLOTS W/32K525
PC-8031A DUAL DRIVES750
PC-8023A MATRIX PRINTER
TRACTOR/FRICTION550
PC-8033A I/O PORT FOR DISK DRIVES 145
THE WEDGE-DISK, RS232 &
GAME I/O W/32K515
DISKETTES
BASF 51/4" DISKETTES (10)25
BASE 8" DISKETTES (10) 29

E	pson	PRINTERS

EPSON MX-70	350
EPSON MX-80	450
EPSON MX-80FT	550
EPSON MX-100	730
QUME SPRINT 5/45	2499

AMDEX LOW-RES 13" COLOR I	369
AMDEX HI-RES 13" COLOR II	850
SANYO 9" B&W	185
ZENITH 12" GREEN	125
NEC 12" GREEN	169
NEC 12" LOW-RES COLOR	365
NEC 12" HI-RES RGB COLOR	875

### ATARI\* 800 & 400

ATARI 800 (16K)	675
ATARI 400 (16K)	
810 DISK DRIVE	439
16K RAM MEMORY MODULE	89
850 INTERFACE MODULE	165
830 ACOUSTIC MODEM	159
ATARI WORD PROCESSOR	125

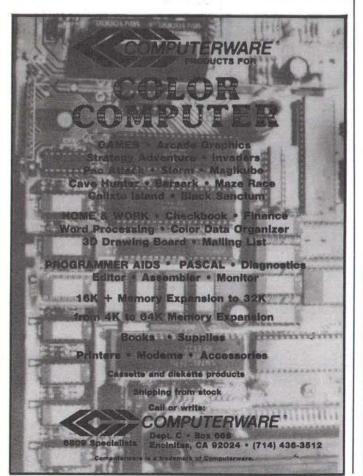
### XFROX 820 "SAM"

SYSTEM I (51/4" DRIVES)	. 2395
SYSTEM II (8" DRIVES)	. 2995
XEROX 630 PRINTER	. 2325
WORD PROCESSING (WORDSTAR)	425
CP/M OPERATING SYSTEM	175

TO ORDER: Please send cashier's check, money order or personal check (allow 10 business days to clear): VISA and Master Card credit card service add 3%. Shipping, and ling and insurance in U.S. add 3% (minimum \$5). California residents add 5% sales tax. Foreign orders add 10% for shipping, Equipment is subject to price change and availability. All equipment carries factory warranty. TELEX: 697120 DATAMAX-SDG

### COMPUTER HORIZON

16766 Bernardo Center Drive, Suite 110B, San Diego, CA 92128 (714) 565-7092 (800) 854-1941



### Software Received\_

puting, POB 513, Columbia, MO 65205.

DOSfix, a set of modifications for TRSDOS for the TRS-80 Models II and III. Floppy disk, \$15 (Model II) and \$10 (Model III). Snapp-Ware, 3719 Mantell Ave., Cincinnati, OH 45236.

Macro-Mon, a machinelanguage utility program for the TRS-80 Models I and III. Cassette, \$54.95; floppy disk, \$59.95 (Model I) and \$69.95 (Model III). Advanced Operating Systems, 450 St. John Rd., Michigan City, IN

Omniterm, a telecommunications software package for the TRS-80 Models I and III. Floppy disk, \$95. Lindbergh Systems, 41 Fairhill Rd... Holden, MA 01520.

Rubik's Cube Coach, a simulator and solution for the Rubik's Cube puzzle for the TRS-80 Model I. Cassette, \$14.95. H & S Computer Co., 1024 Alamosa Dr., Claremont, CA 91711.

Snapp-II, extended BASIC for the TRS-80 Models II and III. Floppy disk, \$200 (Model II) and \$125 (Model III). Snapp-Ware (see address above).

Snapp-III, language enhancements for the BASIC interpreter for the TRS-80 Models II and III. Floppy disk, \$100 (Model II) and \$75 (Model III). Snapp-Ware (see address above).

Snapp-IV, screen-manage-

ment utilities for the TRS-80 Models II and III. Floppy disk, \$100 (Model II) and \$75 (Model III). Snapp-Ware (see address above).

Snapp-V, disk input/output file-management utilities for the TRS-80 Models II and III. Floppy disk, \$75 (Model II) and \$60 (Model III). Snapp-Ware (see address above).

Snapp-VI, a string spacemanagement utility for the TRS-80 Models II and III. Floppy disk, \$100 (Model II) and \$75 (Model III). Snapp-Ware (see address above).

Snapp-VII, a reformatter for BASIC programs to increase readability for the TRS-80 Model III. Floppy disk, \$40. Snapp-Ware (see address above).

Super Color Terminal, telecommunications software for the TRS-80 Color Computer. Cassette and floppy disk, \$69.95. Nelson Software Systems, POB 19096, Minneapolis, MN 55419.

Time Quest, an adventuretype game for the TRS-80 Models I and III. Floppy disk, \$24.95; cassette, \$19.95. The Programmer's Guild, POB 66, Peterborough, NH 03458.

### Other Computers

Adventure adventure-type game for the Sinclair ZX80 and 81. Cassette, \$19.95. Softsync, POB 480, Murray Hill Station, New York, NY 10156. ■

This is a list of software packages that have been received by BYTE Publications during the past month. The list is correct to the best of our knowledge, but it is not meant to be a full description of the product or the forms in which the product is available. In particular, some packages may be sold for several machines or in both cassette and floppy-disk format; the product listed here is the version received by BYTE Publications.

This is an all-inclusive list that makes no comment on the quality or usefulness of the software listed. We regret that we cannot review every software package we receive. Instead, this list is meant to be a monthly acknowledgment of these packages and the companies that sent them. All software received is considered to be on loan to BYTE and is returned to the manufacturer after a set period of time. Companies sending software packages should be sure to include the list price of the packages and (where appropriate) the alternate forms in which they are available.

# Programming PERT in BASIC

A method for planning complex activities where no precedents exist.

Steven Zimmerman College of Business and Management Studies University of South Alabama Mobile, AL 36688

> Leo M. Conrad Imagineering Concepts POB 9843 Mobile, AL 36691-0843

The Performance Evaluation and Review Technique (PERT) is a powerful method of planning complex activities, especially pioneering projects like the creation of a new business or the development of a new machine. The innovative nature of these projects assures that few precedents exist to help estimate performance time.

PERT gives managers the tools to deal with uncertainty; PERT is management in action. It plans, schedules, and controls activity. Using PERT, contractors, builders, engineers, and businessmen can improve planning in the midst of uncertainty and save money as a result.

Until now, only large businesses with access to large computers could use PERT. The program in listing 1 brings PERT's power to microcomputer users. (Our article "Programming the Critical-Path Method in BASIC" in the July 1982 issue of BYTE will present the Critical-Path Method, which places greater emphasis on the trade-off between the time and the costs required to complete a project.)

Before presenting our program,

however, we'll give you a glimpse at PERT's history, briefly describe the nature of PERT analysis, suggest one possible PERT application for a manager, and examine the mathematics behind PERT.

# The events that have zero slack time form the critical path.

### Origins of PERT

PERT dates back to a team created by the Navy Special Projects Office, Lockheed Aircraft Corporation, and the management consulting firm of Booz, Allen, and Hamilton. Work during World War I on the Gannt scheduling chart and the Gannt milestone chart should also be noted because these precipitated the development of the network diagram (described later) used in PERT.

Managers of many different kinds of tasks have successfully applied PERT. One particularly spectacular result of the PERT approach is the Polaris missile, which also occasioned PERT's development. (Lockheed Aircraft was the major contractor for Polaris.) Completion time was critical in the Polaris program, but there was considerable uncertainty about how long the required activities would take. Moreover, the start of many activities depended on the completion of others. These are the chief reasons why PERT employs a network scheme and focuses on the probability of various activities finishing at specified times.

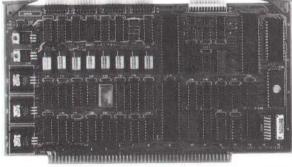
### The Start of PERT Analysis

PERT analysis begins by reducing a project description to a list of events and activities. An activity is a part of a project that consumes resources or time and has a definable beginning and end. An event is a point in time, an instant. The beginning and ending points of an activity are events. To apply PERT to a complex project, you must identify all the events needed to complete the project and all the activities that result in the identified events.

As an example, we'll use a simplified version of an actual con-

Letter	Activity	Beginning Event	End Event
Α	assemble accounting data	1	2
В	look for bank	1	3
C	look for real-estate agent	1	4
C Z D	seek permits	2	7
D	make market study of area	2	3
G	look for contractor	2 2 2	2 3 4 7 3 5
F	seek insurance for con- struction	2	6
Н	get basic architectural plans	3	5
E	make cost study	3	4
1	buy land	3 4	4 5
J	list materials	5	6
K	get more detailed architec- tural plans	5	7
L	have survey made	5	8
M	buy first batch of materials	6	8
0	buy second batch of materials	6	9
N	complete detailed internal layout of foundation	7	8
Q	hire crew	7	9
P	build foundation	8	9

**Table 1:** The activities required to build a foundation. The program in listing 1 uses the letters at left to identify the activities. The two columns at right list the first and last event during each activity. An event is the completion of one or more activities.



### SBC can be redundant!!

- □ Z80A 4MHz, 64K RAM, 2K ROM
- □ 2 serial, 2 parallel, 4 timer ports
- ☐ Bi-directional inter-processor channel
- ☐ Multi-processor architecture capability
- ☐ Redundant processor manipulation
- capability
- ☐ Matching double-density disc controller with SASI and PRIAM interface
- □ Application note for system configurations



struction project that we just completed. To simplify, we'll end our example with the completion of the building's foundation. We identified 18 activities needed to complete this foundation. Table 1 lists the activities, assigned letters A through Q and Z. Each of the nine events in the project consists of the completion of one or more activities.

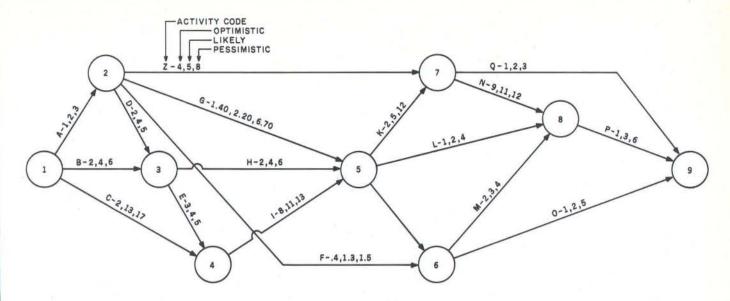
### The Bubble Diagram

The second stage in PERT analysis is the layout of a "bubble" diagram that shows how the necessary activities and events form a sequence of steps. Figure 1 is the bubble diagram of our foundation-building example. With or without PERT, specifying the sequence of a project's steps is obviously an important planning activity. Most contractors lay out the sequence of tasks in a project in some fashion, but PERT makes task sequencing a formal activity. Formalizing this process lends valuable structure to essential planning. In particular, making a bubble diagram forces the planner to specify which activities depend on the completion of others.

Diagrams like that shown in figure 1 are also called networks. A PERT network has one initial event, at the extreme left, and one terminal event, at the extreme right. The circles in figure 1 are numbered and represent events. The lines are lettered and represent activities; each line has an arrow indicating its direction in time from beginning to completion. The network as a whole shows the series of activities that must be performed to complete the project. The arrows show which activities and events logically precede others.

An event that results from completion of more than one activity is called a merge event; an event that represents the joint beginning of more than one activity is called a burst event. Before any activity can start, all preceding activities must be completed (but not all simultaneously). An arrow's length and its compass direction are insignificant.

Dashed lines in network diagrams represent "dummy" activities. A



**Figure 1:** The PERT network diagram of the activities required to build a foundation. Each circle represents an event and each line between circles represents one of the activities listed in table 1. The three numbers given for each activity represent human estimates of the optimistic (minimum), likely, and pessimistic (maximum) time in weeks that each activity will take. The network has one initial event, event 1 at the extreme left, and one terminal event, event 9 at the extreme right. The critical path is the one that takes the most time to get from event 1 to event 9.

dummy activity exists when the completion of one event depends on the completion of another but requires no additional work or activity. PERT handles dummy activities like any others but assigns the activity zero time and zero costs.

#### The Critical Path

The longest route from the beginning of the network on the left to its end on the right determines the time required to complete the project. This line is the critical path, which determines the minimum time required to complete a job. Although the concept of a critical path may sound complex, it is simple once you've laid a project out in a bubble diagram.

Critical-path analysis can reveal ways to shorten the critical path and to control the total length of a job. Because of the size of our computer, a TRS-80 Model I with 32K bytes of memory, we wrote a program that analyzes the critical path but does not attempt to shorten it.

#### Three Time Estimates

Along each activity line in figure 1, you see three decimal numbers. Each



Circle 61 on inquiry card.



# The cost of calling the Big Apple shouldn't make you feel rotten.

The cost of calling city to city needn't put you in a state of shock. Whether you transmit voice, data or facsimile, we could cut your company's long-distance phone bill 40%. With no capital investment or change in equipment. Contact Walt Pioli. RCA Americom, 400 College Road East, Princeton, NJ 08540. (609) 734-4300.



Name/Title	
Company/Phone	
Address	
City/State/Zip	

American Communications
The solution that beats the system

number represents a time expressed in weeks (though you could use any unit of time if you used the same unit for all items). The first of the three numbers represents the optimistic (minimum) estimated time required to complete the activity that the line represents; the second number represents the time that you expect will be required to complete the activity (the likely time); the third number represents the pessimistic (maximum) time, or the time the activity may require if everything goes wrong.

An example will clarify this. Line A in figure 1 connects event 1 to event 2. Line A stands for the activity of gathering and organizing the required accounting data. Event 2 is the completion of the accounting papers needed for construction of our foundation. The minimum time required for line A is estimated at one week, the likely time at two weeks, and the maximum time at three weeks; so the three values 1, 2, 3 are written on line A.

One reason PERT requires these three time estimates is that, as noted earlier, PERT originates from a research project. Since most research project activities are unprecedented, planners can't make a single, accurate estimate of the time each activity requires. The three estimated times are the basis for a statistical estimate of the probability of completing a project or an activity by any given time.

Applying PERT

Applying PERT is simple. A manager who can identify a project's critical path can control time and costs by concentrating on activities along the critical path. If an activity not on the critical path slips behind schedule, the slippage will not usually affect the time required to complete the entire project (although the slippage can hurt if the critical path shifts). Should an activity on the critical path slip, however, the time required to complete the project will increase and the project may be in trouble.

One obvious application of PERT is in making decisions about authorizing overtime on a specific activity. If

Text continued on page 473

**Listing 1:** A program for PERT. Written in TRS-80 Level II Basic, the program asks a list of the activities in a project, the beginning and ending events of each activity, and estimates of the optimistic, most likely, and pessimistic durations of each activity. The program then uses statistical methods to find the critical path of the project, the time required to complete the critical path, and the probability of completing the project by any scheduled completion time.

```
10 CLEAR 1000: CLS: REM "PERt"
20 PRINT"PERT/CRITICAL PATH SCHEDULING PROGRAM"
30 PRINT"DEVELOPED BY STEVEN M. ZIMMERMAN, PH.D.
                                                   & LEO M. CONRAD
                                                                      1980"
40 INPUT"DISK SYSTEM OR LEVEL II BASIC (D/B)":S$
50 PRINT:PRINT"*** NOTE BEGINNING EVENTS WILL BE SORTED INTO NUMBERICAL ORDER *"
:INPUT"DIMENSION FOR ACTIVITIES";D%:PRINT
60 DIM A$(D%, 2), A(D%, 11), SV(11)
70 PRINT"INPUT MENU"
80 PRINT"
              K
                    KEYBOARD"
90 PRINT"
              D
                    DISK FILE"
100 PRINT"
                     READ STATEMENT"
               R
110 PRINT"
               T1
                     TAPE RECORDER #-1"
120 PRINT"
               T2
                     TAPE RECORDER #-2"
130 INPUT"SELECTION"; IO$
140 IFIO$<>"K"THEN 220
150 INPUT"NUMBER OF ACTIVITIES"; M%: EE=0
160 PRINT"THIS IS GOING TO BE WORK YOU MUST NOW INPUT UP TO ":M%:"
                                                                                 AC
TIVITIES"
170 FOR I=1 TO M%
180 INPUT"ACTIVITY CODE "; A$(I,1)
190 INPUT"DESCRIPTION, BEGINING EVENT NUMBER, END EVENT NUMBER, MOST OPTIMISTIC
TIME, MOST LIKELY TIME AND MOST PESSIMISTIC TIME"; A$(1,2), A(1,1), A(1,2), A(1,3), A
(I,4),A(I,5)
200 NEXTI
210 GOTO480
220 IFIO$="T1"ORIO$="T2"THEN230 ELSE330
230 PRINT"SETUP TAPE #-": IO&: " TO PLAY": REM TAPE INPUT
240 IF S$="D"CMD"T"
250 IFIO$="T1"INPUT#-1,M%,EE
260 IFIO$="T2"INPUT#-2, M%, EE
270 FORI=1TOM%
280 IFIO$="T1"INPUT#-1,A$(I,1),A$(I,2):INPUT#-1,A(I,1),A(I,2),A(I,3),A(I,4),A(I,4)
290 IFIO$="T2"INPUT#-2,A$(I,1),A$(I,2):INPUT#-2,A(I,1),A(I,2),A(I,3),A(I,4),A(I,
5)
300 NEXTI
310 IFS$="D"CMD"R"
320 G0T0480
330 IFIO$<>"D"THEN420
340 LINEINPUT"NAME OF FILE:DISK ";B$:REM DISK INPUT
350 OPEN"I",1,B$
360 INPUT#1.M%.EE
370 FORI=1TOM%
380 INPUT#1, A$(I,1), A$(I,2), A(I,1), A(I,2), A(I,3), A(I,4), A(I,5)
390 NEXTI
400 CLOSE1
410 GOTO480
420 IFIO$<>"R"THEN70
430 READM%, EE
440 FORI=1TOM%: REM READ INPUT
450 READA$(I,1),A$(I,2),A(I,1),A(I,2),A(I,3),A(I,4),A(I,5)
460 IFA$(I,1)="END"THEN480
480 REM PRINTS INPUT DATA FOR VERIFICATION
490 M=M%: TP=0: FORI=1TOM: IFA(I,2)>TPTHENTP=A(I,2)
495 NEXT: EE=TP
500 FORI=1TOM-1
510 FORJ=I+1TOM
```

520 IFA(I,1)<=A(J,1)THEN550

```
Listing 1 continued:
530 FDRK=1TD11:SV(K)=A(I,K):A(I,K)=A(J,K):A(J,K)=SV(K):NEXTK
540 FORK=1TO2:SV$(K)=A$(I,K):A$(I,K)=A$(J,K):A$(J,K)=SV$(K):NEXTK
550 NEXTJ, I
560 XX=5:PRINT"VERIFICATION OF INPUT"
570 Z1$="CODE DESCRIPTION EXPECTED EARLY
                                              EARLY
                                                       LAST
                                                                  LAST
                                                                            SLACK"
580 72$="
                           TIME
                                     START
                                              FIN
                                                        START
                                                                  FIN
                                                                            TIME"
590 Z3$="CODE DESCRIPTION BEGIN END
                                         OPTIMIST LIKELY PESSI"
600 Z4$="
                          EVENT EVENT
                                         TIME
                                                  TIME
                                                            TIME"
610 PRINT"NO "; Z3$
620 PRINT"
             "; Z4$
630 K=0
640 C4$="### "
650 FORI=1TOM%
660 PRINTUSINGC4$; I;
670 C1$=" #### "
680 C2$="% % %
                        %":C3$=" ####### "
690 PRINTUSINGC2$; A$(I,1), A$(I,2);
700 FORJ=1TO2
710 PRINTUSINGC1$; A(I, J); : NEXTJ
720 FORJ=3T05
730 PRINTUSINGC3$; A(I, J); : NEXTJ
740 K=K+1:IFK>=13 THENPRINT:INPUT"ENTER TO PAGE";DU$:K=0
750 PRINT: NEXTI
760 INPUT"-2 TO ADD.
                      -1 TO CONTINUE OR NUMBER TO CHANGE"; L: IFL=-1THEN810
770 IFL<>-2THEN790
780 L=M%+1:M%=L:N%=N%+1
790 INPUT"INPUT CODE, DESCRIPTION, BEGINNING EVENT NUMBER, END EVENT
                                                                              NUMBER
, MOST OPTIMISTIC TIME, MOST LIKELY TIME AND THE MOST
                                                             PESSIMISTIC TIME"; A$(L
,1),A$(L,2),A(L,1),A(L,2),A(L,3),A(L,4),A(L,5)
800 GOT0480
810 INPUT "HARD COPY OF INPUT DATA (Y/N)":P$
820 IFP$<>"Y"THEN960
830 INPUT"TITLE"; T$: LPRINT"TITLE: "; T$
840 INPUT"DATE"; T$: LPRINT"DATE: "; T$
850 LPRINT"NO "; Z3$
860 LPRINT"
870 FORI=1TOM%
880 LPRINTUSINGC4$: I:
890 LPRINTUSINGC2$; A$(I,1), A$(I,2);
900 FORJ=1TO2
910 LPRINTUSINGC1$; A(I, J); : NEXTJ
920 FORJ=3T05
930 LPRINTUSINGC3$; A(I, J); : NEXTJ
940 LPRINT" "
950 NEXTI
960 REM NOW THE WORK BEGINS BEGINNING EVENT IS 1 EARLY START =0 FOWARD PASS
970 FORI=1TOM%
980 A(I,6) = (A(I,3) + 4*A(I,4) + A(I,5))/6
990 IFA(I,1)=1THENA(I,7)=0:A(I,8)=A(I,6):GOTO1070
1000 MAX=0.0
1010 FORJ=1TOM%
1020 IFA(J,2)<>A(I,1)THEN1050
1030 IFA(J,8)>MAXTHENMAX=A(J,8)
1040 A(I,7)=MAX
1050 NEXTJ
1060 A(I,8)=A(I,7)+A(I,6)
1070 NEXTI
1080 REM BACKWARD PASS
1090 XM=0.0
1100 FORI=M%TO1STEP-1
1110 IFA(I,2)<>EETHEN1130
1120 IFXM<A(I,8)THENXM=A(I,8)
1130 NEXTI
1140 FORI=M%TO1STEP-1
1150 IFA(I,2)=EETHENA(I,10)=XM:GOT01220
```

```
1160 MIM=99999
1170 FORJ=M%TO1STEP-1
1180 IFA(I,2)<>A(J,1)THEN1210
1190 IFA(J,9) < MIMTHENMIM=A(J,9)
1200 A(I,10)=MIM
1210 NEXTJ
1220 A(I,9)=A(I,10)-A(I,6)
1230 NEXTI
1240 REM SLACK VARIABLE CALCULATIONS
1250 FORI=1TOM%
1260 A(I,11)=A(I,10)-A(I,8)
1270 NEXTI
1280 K=0:REM PRINT DUTPUT
1290 PRINT"CODE DESCRIPTION EXPECTED EARLY EARLY LAST LAST
                                                                 SLACK"
1300 PRINT"
                             TIME
                                     START FIN
                                                     START FIN
                                                                 TIME"
1310 C5$=" ###,##"
1320 FORI=1TOM%
1330 PRINTUSINGC2$; A$(I,1), A$(I,2);
1340 FORJ=6TO11
1350 PRINTUSINGC5$; A(I, J); : NEXTJ
1360 PRINT: K=K+1: IFK=13INPUT"ENTER TO PAGE"; DU$: K=0
1370 NEXTI
1380 INPUT"HARD COPY OF RESULTS (Y/N)":P$:IFP$<>"Y"THEN1450
1390 LPRINT" ":LPRINTZ1$:LPRINTZ2$
1400 FORI=1TOM%
1410 LPRINTUSINGC2$; A$(I,1), A$(I,2);
1420 FORJ=6TO11
1430 LPRINTUSINGC3$; A(I,J); : NEXTJ
1440 LPRINT" ":NEXTI
1450 PRINT"OUTPUT MENU"
             C
1460 PRINT"
                      CRITICAL PATH AND TIME"
               D
1470 PRINT"
                      DISK"
1480 PRINT"
               E
                     END"
1490 PRINT"
               R
                      RECYCLE"
1500 PRINT"
               T1
                      TAPE#-1"
1510 INPUT"
               T2
                      TAPE#-2
                                      SELECTION ": OF$: IFOF$="R"THEN480
1520 IFOP$<>"C"THEN1690
1530 REM IDENTIFICATION OF CRITICAL PATH AND COSTS
1540 CO=0:PATH$=" ":SI=0
1550 FORI=1TOM%: IFA(I,11)>0.00001THEN1570 : REM NOTE >0 SHOULD WORK BUT .00001 U
SED
1560 CO=CO+A(I,6):PATH$=PATH$+" "+A$(I,1):SI=SI+((A(I,3)-A(I,5))/6)[2
1570 NEXTI: C6$="###, ###, ###. ##": SI=SQR(SI)
1580 CLS:PRINT"CRITICAL PATH":PRINTPATH$:PRINT
1590 PRINT"TIME OF CRITICAL PATH": PRINTUSINGC6 $: CO: INPUT "SCHEDULED PROJECT TIME
(USE SAME TIME UNITS AS DATA) "; ST: Z=(ST-CO)/SI: XX=0
1600 BB$="PROBABILITY OF BEING COMPLETED ON TIME": IFZ<OTHEN1640
1610 A=.4361836:B=-.1201676:C=.937298:D=(2.7182818E(-ZE2/2))*(2*3.1415926)E(-.5)
:E=(1+.3326*Z)[(-1):P=1.-D*(A*E+B*E[2+C*E[3):IFXX>OTHEN1630 :REM TAYLOR SERIES
1620 PRINT"Z= "; Z, BB$; P: GOTO1650
1630 PRINT"Z= ";-Z,BB$;1-P:GOTO1650
1640 XX=99: Z=-Z:GOTO1610
1650 INPUT"HARD COPY (Y/N)"; P$: IFP$<>"Y"THEN1450
1660 LPRINT" ":LPRINT"CRITICAL PATH":LPRINT PATH$:LPRINT" ":LPRINT"SCHEDULED PRO
JECT TIME IS ":ST
1670 LPRINT"TIME OF CRITICAL PATH": LPRINTUSINGC6$; CO: IFXX=OLPRINT"Z= "; Z, BB$; P; G
OT01450
1680 LPRINT"Z= ";-Z,BB$;1-P;GOT01450
1690 IFOP$="E"THENEND
1700 IFOP$<>"D"THEN1750
1710 LINEINPUT"NAME OF FILE: DISK "; X$: OPEN"O", 1, X$
1720 PRINT#1, M%, EE
1730 FORI=1TOM%: PRINT#1, CHR$(34); A$(I,1); CHR$(34); ", "; CHR$(34); A$(I,2); CHR$(34);
A(I,1);A(I,2);A(I,3);A(I,4);A(I,5):NEXTI
1740 CLOSE1: GOTO1450
```

```
1750 IFS$="D"THENCMD"T"
1760 IFOP$="T1"PRINT#-1,M%,EE:FORI=1TOM%:PRINT#-1,A$(I,1),A$(I,2):PRINT#-1,A(I,1
),A(I,2),A(I,3),A(I,4),A(I,5):NEXTI
1770 IFOP$="T2"PRINT#-2,M%,EE:FORI=1TOM%:PRINT#-2,A$(I,1),A$(I,2):PRINT#-2,A(I,1
),A(I,2),A(I,3),A(I,4),A(I,5):NEXTI
1780 IFS$="D"THENCMD"R"
1790 GOTO1450
1800 REM PUT DATA HERE FIRST # ACTIVITIES THEN ENDING EVENT NUMBER THEN CODE.
DESCRIPTION, BEGINNING EVENT, ENDING EVENT, OPT. TIME, LIKELY TIME, PESS. TIME FO
R EACH ACTIVITY.
1810 DATA18,9
1820 DATA A, ACCT. PAPERS, 1, 2, 1, 2, 3
1830 DATA Z, PERMITS, 2, 7, 4, 5, 8
1840 DATA B, SHOP BANKERS, 1, 3, 2, 4, 6
1850 DATA C. SHOP REAL EST., 1, 4, 2, 13, 17
1860 DATA D, MARKET STUDY, 2, 3, 2, 4, 5
1870 DATA G, CONTRACTOR, 2, 5, 1.4, 2.2, 6.7
1880 DATA F, INSURANCE, 2, 6, . 4, 1.3, 1.5
1890 DATA H, ART. PLANS, 3, 5, 2, 4, 6
1900 DATA E, COST STUDY, 3, 4, 3, 4, 5
1910 DATA I,LAND, 4,5,8,11,13
1920 DATA J, MATERIAL, 5, 6, 2, 3, 4
1930 DATA K, PLANS, 5, 7, 2, 5, 12
1940 DATA L, SURVEY, 5, 8, 1, 2, 4
1950 DATA M, BUY MAT #1,6,8,2,3,4
1960 DATA O, BUY MAT #2,6,9,1,2,5
1970 DATA N, LAYOUT, 7, 8, 9, 11, 12
```

#### MICROSTAT™ Release 2.0

1980 DATA P, FOUNDATION, 8, 9, 1, 3, 6 1990 DATA Q, HIRE CREW 2,7,9,1,2,3

NEW RELEASE! Just some of the new features of Microstat Rel. 2.0 include: new programs for moments about the mean, skewness, kurtosis and stepwise multiple regression, longer file names, faster sort routine, the ability to declare each data file's numeric precision and drive location plus an expanded user's manual with new appendices for the equations and file structures used in Microstat. Also included is a Data Management Subsystem for file maintenance (edit, list, destroy, augment, sort, rank-order, move and merge) plus transformations (add, subtract, multiply, divide, reciprocal, log, natural log and antilog, exponentiation and linear) that allow you to create new variables from existing variables.

After file creation with DMS, programs for analysis include: Descriptive statistics, Hypothesis testing (mean and proportion), ANOVA (one-way, two-way, and random blocks), Scatterplots, Frequency distributions, Correlation analysis, Simple, Multiple and Stepwise Multiple Regression (including files larger than available memory), Time series, 11 Nonparametric tests, 8 Probability distributions, Crosstabs and Chi-square, Combinations, Permutations and Factorials (up to one million factorial). All program output is neatly formatted for easy use.

The price for Microstat Rel. 2.0 is \$295.00 and the user's manual is available for \$25.00 (credited towards purchase) and includes sample printouts with file lables that reference standard statistical texts and journals so you can compare the results from Microstat to those produced on much larger systems. Compare Microstat to any other package on the market and we think you'll agree that Microstat is the best at any price.

#### ECOSOFT, INC.

P.O. BOX 68602 INDIANAPOLIS, IN 46268-0602 (317) 283-8883





Electric Power Pollution. Spikes & Lightning **HAZARDOUS** to MICROCOMPUTERS!!

- Computer errors caused by power line interference
- Computer errors due to system equipment interaction
- Spike damage caused by copier/elevator/air conditioners

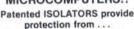
- ISOLATOR (ISO-1) 3 isolated 3-prong sockets; Spike Suppression; useful for small offices, laboratories, classrooms. . . . . ISOLATOR (ISO-2) 2 isolated 3-prong socket banks; (6 sockets
- total); Spike Suppression; useful for multiple equipment installa-SUPER ISOLATOR (ISO-3) similar to ISO-1 except double isolation
- & oversize Spike Suppression; widely used for severe electrical noise situations such as factories or large offices. . .
- socket banks & Oversize Spike Suppression; for the larger system in severe situations. \$104.95
- MAGNUM ISOLATOR (ISO-17) 4 Quad Isolated Sockets; Multiple Spike Suppressors; For ULTRA-SENSITIVE Systems in extremely Harsh environments. . . . . . . \$181.95
- ..... Add \$17.00 AT YOUR DEALERS MasterCard, Visa, American Express ORDER TOLL FREE 1-800-225-4876 (except AK, HI, PR & Canada)

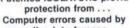
Electronic Specialists, Inc.

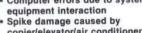
Technical & Non-800: 1-617-655-1532

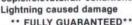














Pat. #4,259,705

171 South Main Street. Natick. Mass. 01760

the activity is not on the critical path. a manager's decision to authorize expenditures for overtime would be foolish and wasteful. All activities not on the critical path have "slack time," the difference between the earliest and latest expected finish. By definition, only the activities on the critical path have zero slack time. We'll elaborate later.

#### Our PERT Program

Our PERT program is shown in listing 1. A dimension (DIM) statement at line 60 provides places to store data on activities. The same DIM statement also provides storage for a dummy variable, SV, to be used later during sorts.

On a system with 32K bytes of memory and two disk drives, our program can handle more than 200 activities. We have yet to need more than 100 activities. Your machine's memory capacity and the limits of your DIM statement will determine the size of the problem that our program can handle for you. You can find the limits by experimentation.

One way to save memory is to carefully omit remark (REM) statements. We used REM statements to index some of our GOTO statements; you must send the GOTO

to the line following any REM statement you drop. Another approach divides the problem into subproblems and treats each subproblem separately. If you can't reduce the problem's memory demands, you can always use the PERT program to determine how to obtain a machine with 48K bytes of memory.

As noted before, the critical path consists of a series of activities that have zero slack time. To find the critical path, you must identify activities that have zero slack time. The program output, consisting of two tables, is designed to identify these activities.

The first table (see listing 2) shows the program's input, listing all the activities in the project, their beginning and ending events, and the three estimates of the time each activity requires. You should check your input whenever you use this program, because otherwise you may get crazy results.

The second table (see listing 3) is the program's output. Notice the last column, "Slack Time." Zeros in this column identify the critical path. You can, of course, trace the activities in the critical path by looking in the first column, "Code," for each activity with zero slack time. But our pro-

Listing 2: A printout of the input for the PERT program sample run shown in listing 1. Input includes the beginning and ending event of each activity and three estimates of the time each activity requires.

TITLE: SAMPLE PROBLEM

DATE: 01/19/81

NO	CODE	DESCRIPTION	BEGIN	END	OPTIMIST	LIKELY	PESSI
		E	EVENT	EVENT	TIME	TIME	TIME
1	. A	ACCT. PAPE	1	2	1.00	2. 00	3. 00
2	B	SHOP BANKE	1	3	2. 00	4. 00	6. 00
34		SHOP REAL PERMITS	1 2	4 7	2. 00 4. 00	13, 00 5, 00	17. 00 8. 00
	5 D	MARKET STU	2	3	2. 00	4. 00	5. 00
6	G	CONTRACTOR	2	5	1.40	2, 20	6. 70
7	F	INSURANCE	2	6	0.40	1.30	1. 50
8	3 H	ART. PLANS		5	2. 00	4. 00	6. 00
	E	COST STUDY	3	4	3. 00	4. 00	5. 00
16	) I	LAND	4	5	8. 00	11.00	13.00
11	J	MATERIAL	5	6	- 2. 00	3, 00	4. 00
	2 K	PLANS	5 5	7 -	2. 00	5. 00	12.00
13	: L	SURVEY		8	1.00	2. 00	4. 00
44.7	M	BUY MAT #1	6	8	2, 00	3. 00	4. 00
15	0	BUY MAT #2	6	9	1.00	2, 00	5. 00
	N.	LAYOUT	7	8	9. 00	11.00	12.00
17	, G	HIRE CREW	7	9	1. 00	2. 00	3. 00
18	P	FOUNDATION	8	9	1. 00	3, 00	6. 00

BOOKS and

For ATARI - PET - OSI - APPLE II - 6502

ATARI BASIC - Learning by ATARI BASIC - Learning by Using
This new book is an "Action"
Book, You do more than read it. Learn the intricacy of ATARIBASIC thorugh the short programs which are provided. The suggestions challenge you to change and write program orutines. Yes, it's exciting — Many of the programs as well as experienced computer users. (Screen Drawings, Special Sounds, Keys, Paddles + Joysticks, Specialized Screen Routines, Graphics and Sound, Peeks and Pokes and special stuff 1).
Order-No. 164
Sep.95

Games for the ATARI-Computer How to program your own games on the ATARI, Complete listings in BASIC and Machine Language of exciting games. Tricks and hints. Order-No. 162

ATMONA-1
Machine Language Monitor for the ATARI 400/800.
This powerful monitor provides
That powerful monitor provides
This powerful monitor support
hat you need to get the most
out of your powerful system.
ATMONA-1 comes on a bootable
cassette. No cartridges required.
ATMONA-1 comes on a bootable
cassette. No cartridges required.
Lang. Memory Dump HEX
+ ASCII. (Change Memory
Locations, Blocktransfer, fill
memory block, save and load
machine language programs, start
mach. Lang. Progr. (Printer
optional). optional)

optional).
Comes with introductionary article on how to program the ATARI computer in machine language. (Available also in ROM) Order-No. 7022 \$19.95

ATMONA-2 Superstapper
A very powerful Tracer to explore
the ATARI ROM/RAM area. Stop
at previously selected address.
Opcode or operand (cassette).
Order-No. 7049 \$49.95

EDITOR/ASSEMBLER for ATARI 800, 32K RAM Extremely fast and powerful Editor/Assembler. (8K Sourcecode in about 5 seconds) Includes ATMONA-1 Order-No. 7098

MACRO-Assembler for ATARI 800, 48K RAM Please specify your system: RAM,

Gunfight - For ATARI 400/800 16K RAM, needs two joysticks, animation and sound, (8K machine language). Order-No. 7207

EPROM BURNER for ATARI 400/800. Bare boards only with description, schematic + software (2716, 2732).
Order-No. 7041 \$99.00

Invoice Writing for very small business with ATARI 400/800 16K RAM. Order-No. 7022, cass. \$29.85 Order-No. 7200, disc. \$39.99 Wordprocessor for ATARI 800.

Order-No. 7210 \$29.95 How to connect your EPSON-Printer to the ATARI 400/800. ircuit board and software. Screenprint and variable characters per line). Order-No. 7210

\$19.95

OSI OSI OSI OSI The First Book of Ohio Scientific Introduction to OSI computers. Diagrams, hardware and software information not previously available in one compact source, 192 pages. Order-No. 157 \$7.95

Urder-No. 157 \$7.95
The Second Book of Ohio Scientificated Book of Ohio Scientification and Comparison of Comparis

The Third Book of Ohio Scientific is now available! is now available! Very important information for the OSI system experimenter. Interface techniques, system expensions, accessories and much more (EPROM-Burner, 8522 I/O-card with 1K RAM, Soundboard, EPROM/RAM board).

678-68-795

The Fourth Book of OHIO VIP-Book — Very Important Programs, Many interesting pro-grams for OSI computers, Sorting (Binary Tree), Differential Equi-tation, Statistics, Astrology, Gas Consumption, Games a. s. o. Order-No. 150

VIP Package — Above book plus a cassette with the programs, Order-No. 160 A \$19.95

The Fifth book of Ohio Scientific Many exciting programs program ming hints and tricks, Textwriter Debugger for C1P, Games, Utilitie and much more (polled keyboard)
Order-No. 161 \$7.95

Invoice Writing Program for OSt C1PMF, C4P. Disk and Cassette 8K RAM. Order-No. 8234 \$29.80

Mailing List for C1PMF or C4PMF 24K RAM 250 addresses incl. phone number and parameters on one 5 1/4 disk) Order-No. 8240 \$29.80 **BK Microsoft BASIC Reference** 

Authoritative reference for the original Microsoft 4K + 8K BASIC developed for ALTAIR and later computers including OSI, PET, TRS-80 and VIC.

Order-No. 141 \$9.95 Authoritative reference for the original Microsoft 4K + BK

Order-No. 141 59.95
Expansion Handbook for 6502
and 6802
S-44 Card Manual describes all of
the 4.5 x 6.5 44-pin S-44 cards
incl. schematics. A MUST for
every 6502 system user (KIM,
SYM, AIM, VIC, PET, OSI)
Order-No. 152 59.95

Microcomputer
Notes
Reprint of Intel's most important application notes including 2708, 8085, 8255, 6251 chips. Very necessary for the hardware buff, Order-No, 153

Complex Sound Generation New revised applications manual for the Texas Instruments SN 76477 Complex Sound Genera-

tor. Order-No. 154 Small Business Programs
Complete listings for the business user, Inventory, Invoice Writing. Mailing List and much more, Introduction to Business Appli-

\$14.90 Microcomputer Hardware Hand-

Microcomputer Hardware Hand-book
Descritions, pinouts and specifi-cations of the most popular microprocessor and support chips. A MUST for the hardware buff. Order-No. 29 \$14.95 \$14.95

Care and Feeding of the Commodore PET Eight chapters exploring PET hardware, includes repair and interfacing information, Programming tricks and schematics. Order-No. 150 59.95 Prototype-Expansion Board for VIC-20 (S-44-Bus).
Order-No. 4844 \$18.95

16K RAM/ROM board for S44-bus. Any combination of RAM and ROM on one board. (SY2128 or 2716) Order-NO. 613

Low cost expanison boards for your APPLE II. Bare board comes with extensive description and

your APPLE II. Bare to with extensive descriptory. Prototyping card Order-No. 604 6522 VIA-I/O Exp. Order-No. 605 2716 EPROM-Burner Order-No. 607 \$29.00 \$39.00 \$49,00 8K EPROM/RAM Card \$29.00

ELCOMP Publishing, Inc., 53 Redrock Lane Pomona, CA 91766, Phone: (714) 623-8314

Payment: Check, Money Order, VISA, Mastercharge, Eurocheck, POSTPAID or PREPAID in USA, 55.00 handling fee for C.O.D. All orders outside USA: Add 15 % shipping. CA add 6.5 % sales tax. ATARI is a registered trademark of ATARI inc. APPLEI inc. a registered trademark of ATARI inc.

## **Announcing Expanded Disk Storage For IBM Personal Computers**

Simple plug-in installation no additional electronics or wiring required.

#### Internal Drives

168K Bytes - IBM Format	\$470.00
336K Bytes - IBM Format. (Double sided drive)	\$570.00
672K Bytes - IBM Format	\$1140.00

#### **External Drives**

Single sided drive with	168K Bytes	\$570.00
(Maximum two drives)		

Double sided drive with 336K Bytes ..... (Maximum one drive)

Includes cable, power supply and cabinet.

Drives are IBM compatibility tested with a 90-day warranty. For more information, call or write:

INTERFACE, INC. 20932 CANTARA STREET CANOGA PARK, CALIFORNIA 91304

Quantity and dealer discounts available upon request.

# Rece Moore Sample-Pac™ when you request your

free Moore Computer Supplies Catalog

 Large selection of leading brand name supplies at low prices.

Fast delivery from regional warehouses.

 Only toll-free technical assistance line in the industry.

 Your bonus—free samples of our most popular products.

For your free Moore Computer Supplies Catalog, call toll-free,

800-323-6230,\* ext. 139 or complete and mail the coupon below.

\*In Illinois, call 312-459-0210, ext. 139 In Alaska and Hawaii, 800-323-4185, ext. 139



Catalog Group MOORE RUSINESS CENTER

A Division of Moore Business Form

Moore Computer Supplies Catalog Department 139 P.O. Box 20 Wheeling, Illinois 60090

Name

Company

Address City

Mail this coupon today!

gram also provides a menu option C CRITICAL PATH AND TIME, which prints both the critical path and the time required to complete it.

A word of caution about using the program: round-off problems in cal-

#### PERT and CPM

The Performance Review and Evaluation Technique (PERT) and the Critical-Path Method (CPM) are managerial tools that emerged in the late 1950s. Both PERT and CPM rely on network diagrams to analyze projects. PERT was developed to guide the management of complex research and development projects.

By their nature, such projects have no precedents to guide planners in estimating how long each activity in a project will take. Planners must resort to statistical methods to estimate actual performance time. PERT's developers wanted to know how long a project could be expected to last and, given a scheduled completion date, what probability there was of actually meeting the date.

CPM, on the other hand, was developed by duPont and Remington Rand Univac to determine how time required for routine construction and maintenance can be reduced. Here experience can serve as a guide for estimating the time required for each activity in a project. CPM assumes these are reliable estimates and concentrates on determining the optimal trade-off of total time required for a project and the total cost of a project. Rather than asking how long the project will probably take or what chance there is of meeting a schedule, CPM seeks to determine a project schedule to minimize direct and indirect costs. (An example of an indirect cost is production time lost while a manufacturing plant closes for maintenance.)

An article entitled "Programming the Critical-Path Method in BASIC by Dr. Zimmerman and Mr. Conrad will appear in the July issue of BYTE. That article will use the same construction project that appears as a sample case in this article. Although the routine character of the project makes it better suited to analysis by CPM than by PERT, the authors chose to use the same example for both articles to show the similarities and contrasts between the two managerial techniques. . . P.L.

culating the critical path forced us to define zero slack time as 0.00001 instead of true zero. Where small differences are important, this approximation of zero can cause problems. The value 0.00001 is entered at line 1550; perhaps you can change the value to true zero for some of your applications. Furthermore, since we used statistical methods to determine the probability of a project's being

completed on time, given a scheduled completion date, you should remember that data generated by the program is based on estimates and is itself an estimate.

#### Running the Program

The easiest way to input data is to use DATA statements at the end of the program. Entering data from the keyboard takes time and increases the number of errors. The following description of a program run assumes that DATA statements were used for input.

The data needed (see listing 2) include the name of each activity, its beginning and ending events, and the optimistic, likely, and pessimistic estimates of the activity's length.

Whether you input data from DATA statements or the keyboard,

**Listing 3:** Output of the PERT program sample run in listing 1. Activities on the critical path are identified by zero slack time (shown in column on far right), where slack time is the difference between earliest (column 5) and lastest (column 7) expected finish. The program has printed the critical path, C I K N P, the project's expected duration (42.3333 weeks), and the probabilities of project completion in 35 weeks and 50 weeks.

CODE	DESCRIPTION	EXPECTED	EARLY	EARLY	LAST	LAST	SLACK
		TIME	START	FIN	START	FIN	TIME
A	ACCT. PAPE	2.00	0.00	2.00	2. 00	4. 00	2.00
В	SHOP BANKE	4.00	0.00	4. 00	3. 83	7. 83	3. 83
C	SHOP REAL	11.83	0.00	11.83	0.00	11.83	0.00
Z	PERMITS	5. 33	2.00	7. 33	23. 00	28. 33	21.00
D	MARKET STU	3. 83	2.00	5. 83	4. 00	7. 83	2.00
G	CONTRACTOR	2. 82	2.00	4. 82	19.85	22. 67	17.85
F	INSURANCE	1. 18	2.00	3. 18	34. 98	36. 17	32. 98
H	ART. PLANS	4. 00	5. 83	9. 83	18. 67	22. 67	12.83
E	COST STUDY	4. 00	5. 83	9. 83	7. 83	11.83	2.00
I	LAND	10.83	11.83	22. 67	11.83	22. 67	0.00
J	MATERIAL	3. 00	22. 67	25. 67	33. 17	36, 17	10.50
K	PLANS	5. 67	22. 67	28. 33	22. 67	28, 33	0.00
L	SURVEY	2. 17	22. 67	24. 83	37. 00	39. 17	14. 33
M	BUY MAT #1	3. 00	25, 67	28. 67	36. 17	39. 17	10.50
0	BUY MAT #2	2. 33	25. 67	28. 00	40.00	42. 33	14. 33
N	LAYOUT	10.83	28. 33	39. 17	28. 33	39. 17	0. 00
Q	HIRE CREW	2. 00	28. 33	30. 33	40. 33	42. 33	12.00
P	FOUNDATION	3. 17	39. 17	42. 33	39. 17	42. 33	0.00

CRITICAL PATH

SCHEDULED PROJECT TIME IS 42.3333 TIME OF CRITICAL PATH

42. 33

Z= 0

PROBABILITY OF BEING COMPLETED ON TIME . 5

CRITICAL PATH

SCHEDULED PROJECT TIME IS 35 TIME OF CRITICAL PATH 42.33

Z= -2. 24537

PROBABILITY OF BEING COMPLETED ON TIME . 0123852

CRITICAL PATH

SCHEDULED PROJECT TIME IS 50 TIME OF CRITICAL PATH

42, 33

Z= 2.34743

PROBABILITY OF BEING COMPLETED ON TIME . 990536

SOMEDAY . . . in the comfort of your own home or office, you'll be able to shop and bank electronically, read instantly updated major newswires, analyze the performance of a stock that interests you, send electronic mail to business associates across the country, then play Bridge with your best friend in San Francisco and two strangers in Chicago and Dallas.

## **WELCOME TO SOMEDAY**

Someday is today with the CompuServe Information Service. All this and more can be accessed with a local phone call in most major U.S. cities. For hardware you need a terminal or personal computer and a modern. The CompuServe Information Service costs only \$5.00 per hour, billed in minute increments to your charge card.

Ask for a demonstration at a Radio Shack® Computer Center. Videotex software is available for various brands of personal computers. CompuServe Information Service, 5000 Árlington Centre Blvd., Columbus, Ohio 43220. (614) 457-8650.

## CompuServe

# **INVESTMENT ANALYSIS**

CENTENNIAL SOFTWARE / 410 17TH ST. SUITE 1375 / DENVER, CO 80202 / (303) 595-9193

#### STOCK-FOCUS

Find out how low is low and how high is high. Using capital structure and performance data, Stock-focus objectively calculates the underlying value of a stock. The system was first developed by the management science department of a major money center bank, and is now in use by investment advisors, trust companies and brokerage houses. On your screen, Stock-focus will plot an estimate of lowest value, highest value and the current price. You then decide what to buy, sell or hold.

#### **REAL-FOCUS**

Exhaustively analyze potential real estate invest-ments using the Wharton School's approach to real estate analysis. In minutes you can project profit, costs, and IRR for any project over a 10 year period. Realfocus accounts for amortization, debt, income, operating expenses, taxes, depreciation, and cash flows for both after-tax holding and the results of sale. With Real-focus you can analyze any potential investment from a single building project to a complex time-phased planned unit development.

#### THE FOCUS TECHNIQUE

FOCUS is CENTENNIAL SOFTWARE'S NEW approach to Program Architecture, providing a natural interaction between microcomputers and users. It provides worksheet style input screens, free access to all program segments, and the ability to combine individual results files for portfolio analysis. You also receive a usable reference manual, menu helps, a program glossary, multiple report formats and spooling. With our FOCUS technique even the most complex programs are versatile and easy to use.

COMPUTER IBM PC	MEMORY-K 64	REAL-FOCUS \$179.00	STOCK-FOCUS \$189.00
	32/48	149.00	159.00
Apple (plus) II TRS-80 I	32/48	149.00	159.00
TRS-80 II	64	179.00	189.00
TRS-80 III	32/48	149.00	159.00

ALL PROGRAMS IN DISK BASIC IBM is a trademark of IBM, Apple is a trademark of Apple Computer Corp., TRS-80 is a trademark of Tandy Corporation.

ORDER NO	OWI FILL IN O	R CALL 800-52	5-2003 (Toll Free)		
PROGRAM	NAME		COMPUTER		MEMORY
NAME .				PHONE #	
ADDRESS .					
Managara Managara				_	WISA TIESTED THAT
ACCOUNT	#			EXP. DATE _	

the program begins by giving an identification message and then asks:

#### DISK SYSTEM OR LEVEL II BASIC (D/B)?

Our example will work the same way whichever answer you give. The program next asks the number of activities, using the answer as the basis for a dimension statement. As noted earlier, you must have enough memory to dimension the number of activities in your project.

The program presents the message:

\*\*\* NOTE BEGINNING EVENTS WILL BE SORTED INTO NUMERICAL ORDER \*

when asking

#### DIMENSION FOR ACTIVITIES?\_\_\_

As you see in listing 2, events are arranged according to the earliest starting event in each activity, and ties are broken by reference to the earliest ending event for each activity.

Now the program presents the input menu:

#### INPUT MENU

- K KEYBOARD
- D DISK FILE
- R READ STATEMENT
- T1 TAPE RECORDER#-1
- T2 TAPE RECORDER#-2 SELECTION?\_

Option R causes the program to read DATA statements at the end of the program. After a brief delay, the program will display for verification the input that was read.

The video display of the input will look slightly different than the table in listing 2 because of differences in the screen and printer sizes. If a single screen won't accommodate all the input, the program will ask you to page through.

After listing all the input, the program will say:

#### -2 ADD, -1 TO CONTINUE OR NUMBER TO CHANGE?\_\_

The number referred to is the number

of any activity that you wish to change. Assuming you want to continue and enter -1, the program will

#### HARD COPY OF INPUT DATA (Y/N)?\_\_

If you request hard copy, the program will ask

> TITLE?\_\_ DATE?

and will print your responses at the top of the page. Our sample set of data used the title SAMPLE PROB-LEM and the date 01/19/81.

After the input is printed, the screen will display the results, as shown in listing 3. For each activity, you will see computations of how long it should be expected to take, the earliest week it can start, the earliest week it can finish, the last week it can start, the last week it can finish, and the slack time (the difference between the earliest and latest possible finish). You may have to page through a screen display of this data. The program will again ask if you want hard

Then you will see:

OUTPUT MENU CRITICAL PATH AND

TIME

DISK D E END

R RECYCLE

T1

TAPE#-1 T2

TAPE#-2

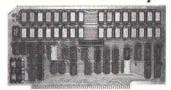
SELECTION?\_

Option C, for our example, results in a display like the following:

CRITICAL PATH CIKNP TIME OF CRITICAL PATH 42.33 SCHEDULED PROJECT TIME (USE SAME TIME UNITS AS DATA)?\_\_

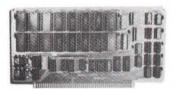
For our example, the critical path consists of shopping for a real-estate agent, obtaining land, getting architectural plans, getting a detailed

### 3 Great Memory Boards From S.C. Digital



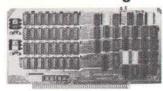
64K DYNAMIC RAM 'Uniselect: 2' Model 64KUS features:

16 or 24 bit address. ■ 8 bit data. ■ Bank select by SW settable port, bits in two blocks. • Two 32kb (128kb) addressing. • Transparent refresh - same as M:256KE. Fast access time - 220nsec, will run with Z80, Z8000 to 4mhz, 8080, 8085, 8086, 8088 to 5mhz without Wait States. . Can be configured to various multiusers OS's. Expandable to 256KB using 4164's.



32 STATIC RAM 'Uniselect: 3' Model 32KUS features:

 Fully Static using 2k by 8 NMOS chips.
 16 or 24 bit address.
 8/16 bit wide data.
 Bank Select by port and bit in 32K block.
 Two 16K block addressing with window capability in 2k increments. • EPROM can be mixed with RAM. • Fast access - 250nsec from address valid - will run with Z80, Z8000 to 4mhz, 8080, 8085, 8088, 8086 or 68000 to 8mhz without Wait States. Provision for Battery Backup using NMOS or



256K DYNAMIC RAM Model 256KE

features: ● 16 or 24 bit address. ● 8/16 bit wide data. ● Transparent refresh with unlimited DMA, immune to Wait States, halts, resets. Fast access time 180nsec from Smemr or Psync high, will run with Z80, Z8000 to 4mhz, 8080, 8085, 8086 to 8mhz without Wait States. Accepts 4116, 4064's.

Model	Prices	Assembled & Tested
256KE	\$795	256KB
256KE-128	\$535	128KB
64KUS-128	\$515	128KB
64KUS-64	\$395	64KB(4164's)
64KUS	\$395	64KB(4116's)
64KU-16	\$285	16KB
32KUS	\$399	32KB
32KUS-16	\$269	16KB
32KUS-N	\$149	No Memory
32KUS-B	\$ 72	Bare board with Doc

All boards conform to IEEE696/S100 specifications, fully socketed Jegends masks Gold contacts Guaranteed One

Delivery is within 3 working days. MC, Visa or COD orders accepted. Illinois residents add 51/4 % sales tax.

O.E.M. & DEALER PRICING AVAILABLE

S.C. DIGITAL

P.O. Box 906, Aurora, Illinois 60507 Phone (312) 897-7749

## multiuser WICAT system 150

The WICAT 150-WS set a new standard of price/performance with its powerful Motorola 68000 processor, large memory, hard disk, floppy disk, and complete system software.

Now there is a flexible efficient multiuser System 150. Memory and resources are assigned dynamically to each user as needed. Program code is shared to avoid multiple copies. Backround processing can be initiated. All of the power of the top of the line WICAT System 100

Concurrent Corporation will be adding full network database and screen management software as well as applications soon. We can discuss your needs with you and help select the proper configuration. Please write or call

(513) 281-1270.



#### \$8500

WICAT System 150-WS (single user) Motorola 68000, terminal, 10MB Winchester, 960KB floppy, 256K memory, 1 parallel and 2 serial ports, system software .....

WICAT SYSTEM 150-3 (three user) Motorola 68000, terminal, 10MB Winchester 960KB floppy, 256K memory, memory management, 1 parallel and 2 serial ports, system software .....

WICAT SYSTEM 150-6 (six users) Motorola 68000, terminal, 10MB Winchester, 960KB floppy, 512K memory, memory management, 5 serial and 1 parallel ports, system



ncurrent

1870 Madison Road Cincinnati, Ohio 45206

layout for construction, and actually building the foundation. The time of the critical path is expected to be 42.33 weeks.

You can now input the scheduled time for the project, and the program will use the Z calculations explained in the textbox "A Glance at the Mathematics of PERT" to tell you the probability of meeting the schedule.

As shown in listing 3, there is a 0.0123852 probability of finishing in 35 weeks and a 0.990536 probability of finishing in 50 weeks. As noted earlier, there is also a 0.500 probability of finishing in the expected time of the critical path—42.33 weeks.

#### Conclusion

If you need help planning and

scheduling complex projects, our PERT program can provide it. You can use it without knowing how to perform the calculations involved. Although we repeat our caution about relying on estimate-based estimates, we still believe PERT has proved itself a valuable managerial tool and that our program accurately represents PERT.

#### A Glance at the Mathematics of PERT

The mathematics of PERT involves some interesting statistical concepts. You don't have to understand the mathematics to use PERT, but it helps you to understand how our program works.

First, we must refresh your recollection of some basic statistical terms. The mean of a set of occurrences of some variable is the arithmetic average of the values of the occurences; the standard deviation shows the variability of occurrences from the mean (more precisely, the standard deviation is the square root of the mean of the squares of the deviations of individual occurrences from the mean); the variance is the square of the standard deviation.

For example, if we have three values 9, 12, and 15, their mean is 36/3 = 12, their variance is

$$(9-12)^2 + (12-12)^2 + (15-12)^2 = 18$$

and the standard deviation is the square root of 18, which is approximately 4.24.

It is a common statistical assumption that the standard deviation in unimodal distributions (distributions that have only a single most-likely-occurring value) is roughly a sixth of the range of distribution. The basis for this estimate is the fact that 89 percent or more of any distribution lies within three standard deviations of the mean; and for the normal distribution, 99.7 percent of the distribution lies within three standard deviations of the mean.

Since we have estimates of the minimum time a and the maximum time b required to complete an activity, we have established an estimated range of actual times. We can estimate the standard deviation of the actual time as:

$$\frac{(b-a)}{6}$$

Since PERT assumes that chance, or random, factors will influence the actual time needed to complete an activity, we can expect the actual times to be distributed along some curve. PERT assumes that the mean actual time will follow the distribution known as the beta distribution, which is contained in a finite interval and may be either symmetric or skewed. Our most likely time of completion m is the mode of the curve for each activity. The following equation, based on the assumption that our formula for the standard deviation is correct, is a linear approximation of the value of the expected value, EV, of the mean time:

$$EV = \frac{(a+4 \times m+b)}{6}$$

As you can see, this is just a weighted average, counting the minimum and the maximum each once and the mode four times, then dividing the total by six. On line 980 of listing 1, the same equation is expressed as:

$$A(I,6) = (A(I,3) + 4 * A(I,4) + A(I,5))/6$$

The following equation gives the variance of the beta distribution for each activity:

$$VAR = ((b-a)/6)^2$$

For each activity, the program applies the statistical principles described above and calculates the time the activity should last, the earliest time at which it can start, the earliest finish, the latest start, and the latest finish. Calculation of the earliest start and finish times is called the "forward pass" and takes place in our program at lines 960 through 1070. Calculation of the latest start and finish is called the "backward pass" and takes place at lines 1080 through 1230.

The difference between the earliest and latest projected finish for each activity is called "slack time." At lines 1240 through 1270, the program calculates slack time for each activity. The events that have zero slack time form the critical path.

To obtain the approximate variance for the critical path, add the variances of the activities on the path:

$$VAR(Path) = VAR(1) + VAR(2)$$
  
. . . +  $VAR(n)$ 

It happens that the Central Limit theorem enables us, based on the foregoing, to assume that the distribution of the time required to complete the critical path is normal. Based on this assumption, we can calculate the probability of the project's being on time, given some specified target completion time. The calculation's basis is the deviation of the scheduled completion time from the estimated mean completion time, with the deviation measured in units of standard deviations. This deviation is called Z. The Z calculation for the standard normal table is:

$$Z = \left(\frac{\text{scheduled} & \text{time of} \\ \text{time} & -\text{critical path}}{VAR(path)}\right)$$

Rather than require you to use normal tables with our program, we have built in a Taylor series to approximate the tables. (A Taylor series is a power series that gives the expansion of a function f(x) in the neighborhood of a point a, provided all derivatives exist and the series converges.) The Taylor series is located at line 1600 and following in our program.

The expected time of the critical path is the sum of the expected times of all the activities on the path. If the scheduled time of the project equals the expected time of the critical path, you have a 50 percent chance of completing the project on time.

## CP/M, Your Time Has Come

A real-time clock for the most popular microcomputer operating system.

J. L. Calaway and B. Hill c/o Teleshows Inc. 6842 Ranchito Ave. Van Nuys, CA 91405

Have you ever looked with envy at big computers that have built-in, real-time clocks? If so, this project may be for you. We had a business program that required such a clock, but the application neither warranted the expense of a clock board nor required split-second accuracy. We needed a time-of-day reference rather than a precise generator of program interrupts and we needed to be able to access the clock and print the time from either the operating system or a BASIC program. We wanted something like the clock in Digital Research's MP/M, but we also wanted our clock to work with earlier versions of CP/M.

The project turned out to be reasonably easy to implement in both hardware and software. Anyone running CP/M with a disk drive and a Z80 or 8080 processor can have a clock like ours with little difficulty. The part of the project that requires the most care is integrating the software into the existing CP/M system. If you're rusty at using CP/M's DDT (debugger), ED (editor), and ASSEMBLER programs, here is a chance to practice on a worthwhile project.

#### **Building the Clock Hardware**

Figure 1 shows all the hardware we need. The unregulated +8 V power bus in most computers has a lot of 120-cycle ripple riding on top. We differentiate this ripple with a condenser (C1) and a resistor (R1). By

#### About the Authors

Jack Calaway is an engineering consultant specializing in hardware and software systems for the television post-production industry. He is interested in computer languages and flying. His computer equipment consists of a mature S-100 system with four disk drives, a line printer and several types of processors, including Intel 8080, Zilog Z80, Motorola 6800, and Intel 8088.

Ben Hill is president of Teleshows Inc, which provides television production services to the industry. He is interested in music and photography and has a special interest in business applications for computers. His equipment is a three-disk S-100 system with a Perkin-Elmer OWL terminal and a Diablo printer.

feeding the result into a high-gain LM324 operational amplifier (IC1), wired as a comparator, we get a 120-cycle pulse output. (The output isn't quite symmetrical, but that's not a problem in this application.)

Now that we have pulses to count, the rest of the hardware is easy. The 7490 (IC2) is used as a divide-by-10 counter, and its output feeds the 7492 (IC3), which is connected as a divide-by-12. The result: a divide-by-120 and one pulse per second on the output of the counter chain. Thanks to your friendly utility company, the pulse is accurate to 0.05%.

This one-second pulse is now fed to a 7400 NAND gate (IC4). Two of the gates in this device are connected as a familiar set/reset latch. Another gate is used to invert the processor interrupt-acknowledge pulse (SINTA, pin 96 on the S-100 bus). The diode on the POC (power-on clear) line (pin 99 on the S-100 bus) allows setting the latch on power-up but prevents the acknowledge pulse from feeding back down the POC line. Since the count pulse is too wide, we differentiate it with a condenser (C2) and a resistor (R2) and then feed it to pin 5 of IC4. The output of the latch (pin 3) is fed to the PINT (processor-interrupt) line (pin 73 on the S-100 bus). In operation, the clock pulse triggers the latch and PINT goes low. It stays low until the processor acknowledges the interrupt via SINTA and again presets the latch.

We could use a faster pulse time, but it would complicate the project. Each disk access by a running program will disable the interrupts. If clock pulses came in at a faster rate—say 60 times a second—then some method would have to be devised to keep track of those pulses occurring during disk access. Otherwise the pulses that occurred while the interrupts were disabled would be lost and the clock would lose time. Fortunately, disk-access times are usually less than 1 second. Since the latch will hold the clock request that long, the processor will recognize the clock pulse when the disk controller turns the interrupts back on.

The switch on the PINT line is there so that you can disable the clock. Some programs enable interrupts. DDT

is an example. Since DDT uses the same restart instruction as the clock program (RST.7), you must disable the clock to prevent mutual interference whenever you use DDT. Furthermore, if you use interrupts in your system, you won't be able to use the hardware described here.

You can construct the circuit using space on one of your boards or on a piece of perf-board. The layout is not critical. You can use either wire-wrap or point-to-point wiring with solder. When you complete your board, check for a one-second pulse at pin 3 of the 7400. If you have it, your clock hardware is working properly.

#### Clock Software

The clock software consists of four parts:

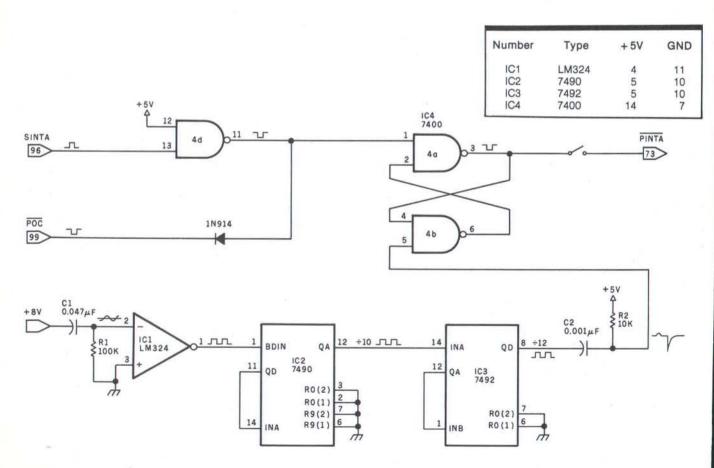
- code that establishes an area in memory to act as a communications link between the BIOS (basic input/output system) and the clock program on disk
- ·a program that controls, sets, and reads the clock
- modifications in the BIOS to prepare it for handling the clock-generated interrupts
- code that adds BIOS to the clock routines that are accessed during each interrupt to update the time

If you have a listing of your BIOS, now is the time to dust it off and use it. If you don't have a listing, get the name of your BIOS file from your system manual and print a listing to use as a reference while implementing this clock. You can print the listing by using the TYPE command on the ASM file that contains the BIOS or on the PRN file produced by assembling the file.

Note that some of the file names used in this article may not match the names used in your system. To prevent confusion, we describe file references as fully as possible.

#### Establishing a Communications Area

There are 16 unused bytes in CP/M's BIOS, starting at address 40 hexadecimal. We will use 7 bytes of this for our communications area. But first, look at the EQUATES or SYMBOL TABLE section at the beginning of your freshly printed BIOS. See if any of the labels or equate statements use address 40. If none does, then you are free to use any of those 16 bytes. If some of the locations are used, don't write over them or you will "clobber" your operating system. Instead, pick another location. The CP/M manual lists the addresses that are free in low memory. Look in the section called the CP/M



**Figure 1:** The hardware required to generate the clock interrupts for the CP/M clock programs. This design uses the inherent stability of the AC line to generate accurately timed pulses. The LM324 sees the few hundred millivolts of AC ripple riding on top of the computer's +8 V supply and makes a pulse out of it. Using this approach makes it unnecessary to bring AC into the board. The counters divide the pulse down to one per second.

Alteration Guide, under the heading "Reserved Locations in Page Zero."

You don't have to use the locations at 0040 hexadecimal, or even low memory for that matter. You can use any location that isn't reserved by CP/M. If you decide to use a high-memory location (i.e., above the BIOS), remember that you will have to change the addresses of all programs that use the clock whenever the size of the CP/M system is changed. Also, whatever location you do choose will become the value to be used in the TIME program equate: BASE.

Assuming we have picked 0040 hexadecimal as the starting location for our communications area, here is how hexadecimal addresses are employed: the address of the clock routine is stored at 0040 and 0041. This is set by the BIOS and is used by the time program when starting the clock. The clock ON/OFF flag is at 0042 (ON=1, OFF=0), 0043 is the seconds register, 0044 is the minutes register, 0045 is the hours register, and 0046 is the AM/PM flag (AM=0, PM=FF).

#### The TIME Program

TIME is a short machine-language program that resides permanently on your system disk. In addition to reading and setting the clock, TIME checks to see if the BIOS has the code to handle the required interrupts. TIME also checks for valid time entries from the terminal.

As a command file, TIME may be called in response to CP/M's prompt. The time-of-day registers maintained by the BIOS may also be read by a BASIC program that uses the PEEK instruction. The clock may be called as often as desired with either method, but the actual starting and stopping of the clock can be done only in TIME's command mode.

To set the time and start the clock with this program, get the A> prompt, and then type:

TIME 120000PM (or any valid 12-hour clock time)

The program will respond with:

#### START CLOCK BY PRESSING RETURN

When return is pressed, the clock is started and the following message is displayed:

TIME SET TO = 12:00:00 PM (the set time)

The clock is now running and will continue to run without intervention. The clock won't interfere with your other programs unless they require the use of interrupts.

To read the time, type:

#### TIME

The program will display the time in this format:

12:00:15 PM

To stop the clock, type:

#### TIME STOP

This will stop the clock and display a message like:

#### STOPPED AT 12:00:15 PM

When you start the clock again, you must, of course, reset it. There is no provision for a split-time register.

#### Modifications

Now that we have a clock pulse, a program to process it, and a place in memory to store it, we need a few changes in the system BIOS to make it all work. The areas in BIOS that are affected by the clock program are as follows:

- The EOUATE area. We need to add EOUATES to tell the assembler what addresses we have chosen for the communications section.
- The cold boot (bootstrap) routine. When initializing the system or using the cold boot start, RST-7 has not yet been set up, so the clock must be disabled by setting the ON/OFF flag to OFF (0).
- The GOCPM area in the BIOS is used at program exits and by both cold and warm boots. During the cold boot, the ON/OFF flag is set to 0 and the interrupts are not turned on. With a warm boot, however, we don't know whether the clock is ON or OFF, so we check it. The program then decides what to do: either turn the clock OFF. or leave it OFF if it already is.
- The SETUP routine section sets up jumps into CP/M in low memory. Since the CP/M size changes if you add memory, we add a bit of code here to tell the communications area the address of the clock in BIOS. The TIME program, which sets up the restart address-link to the BIOS clock, must get the address from the communications area.
- The READ and WRITE routines. If the disk controller does not use DMA (direct memory access), or if it does but uses it in the direct-transfer mode, we must disable the interrupts while we are doing a read or write to disk. The code entered here turns off the interrupts and then turns them back on again as soon as possible to avoid losing any counts. Check your disk-controller manual to see what kind of read/write system it uses. If your controller tolerates interrupts during the read/write cycles, then you need not implement this section of code.
- Add the clock coding to BIOS. The program in listing 1 provides the coding necessary to handle and service the clock interrupts. At the end of this code is a short section called INTON. This code saves the processor status in a register, then checks the ON/OFF locations. If the clock ON/OFF location is ON (1), the interrupts are enabled. If the clock is OFF (0), the interrupts are left disabled. Note again that if your terminal or printer input/output routines in BIOS use interrupts, you will not be able to implement this clock.

The preceding summarizes the changes needed in BIOS to implement the clock. The clock counter is kept in binary-coded-decimal form. The lower 4 bits of each byte hold the units of time, while the upper 4 bits hold tens of units. Since there is no way of knowing how much stack space your system has allowed, the interrupt handler routine is coded as simply as possible.

#### Putting It All Together

The new code to be added to the BIOS is shown in listing 1. It is generally compatible with all versions of CP/M, but in version 2.0 and later, make sure that adding this code doesn't exceed the BIOS size allowed by your system.

To start, find the equivalent code in your listing, and with your editor call up your CBIOSXX.ASM (where C stands for "custom" and XX is the size of your system). Put in the new EQUATES at any convenient location in your BIOS EQUATE area, and follow listing 1 for the rest of the new code. Remember: don't write over or delete any code in your BIOS. Just make additions.

After you have made the changes, save the file. This will give you a new CBIOSXX. ASM file that contains the additions. Starting at this point you should work on a

Text continued on page 486

Listing 1: The clock program that is added to the CP/M BIOS. It enables the system BIOS to handle the one-a-second interrupts generated by the clock hardware and maintains the accumulated time in registers located in low memory. Once the clock is started, this program maintains the time registers without interference with other operating programs.

```
CLOCK PROGRAM BIOS CODE BY J. L. CALAWAY AND
 B. HILL. FEB 10, 1981
                           LISTING #1
                                        REVISION 1
  CODE TO BE ADDED TO THE SYSTEM BIOS TO IMPLEMENT THE
  CLOCK PROGRAM
  IN THE AREA USED BY BIOS TO SET THE VARIOUS EQUATES
  AND CONDITIONALS, WE ADD THE EQUATES NEEDED TO
  DEFINE THE CLOCK COMMUNICATIONS AREA
;
                                  ; ENABLE REAL-TIME-CLOCK
CLOCK
        EQU
                 TRUE
BASE
                 00040H
        EQU
                                   COMMUNICATIONS AREA
                                  ; ADDRESS INITIATED BY BIOS
CLKADR
        EQU
                 BASE
ONOFF
                                 ; ON/OFF FLAG 0=OFF
        EQU
                 CLKADR+2
                 ONOFF+1
                                 ; BCD SECONDS
SEC
        EQU
                                 ; BCD MINUTES
MIN
        EQU
                 SEC+1
                                 ; BCD HOURS
HRS
        EQU
                 MIN+1
AMPM
        EQU
                HRS+1
                                  : AM=O, PM=FF
  IN THE COLD BOOT SECTION
        XRA
                 A
                                   EXISTING CODE, NO CHANGE
        STA
                 IOBYTE
                                   EXISTING CODE, NO CHANGE
        IF
                 CLOCK
                                   NEW CODE TO BE ADDED
        STA
                ONOFF
                                    SET ONOFF=0
        ENDIF
                                    END OF NEW CODE IN THIS SECTION
  IN THE GOCPM SECTION WHERE CONTROL IS TRANSFERED
  TO CP/M, WE ADD A CHECK TO SEE IF THE INTERRUPTS
  SHOULD BE ON, OR OFF
        LDA
                DISKNO
                                   EXISTING CODE, NO CHANGE
        MOV
                C,A
                                  ; EXISTING CODE, NO CHANGE
        IF
                 CLOCK
                                   NEW CODE TO BE ADDED
                                 ; GET FLAG
        LDA
                ONOFF
        ORA
```

TEST

A

```
Listing 1 continued:
                                ; START WITHOUT INTERRUPTS
        JZ
                CPMB
                                 ; TURN ON INTERRUPTS
        EI
        ENDIF
                                 : END OF NEW CODE
                                 ; BACK TO OLD CODE. NO CHANGE
        JMP.
                CPMB
  IN THE AREA WHERE A JUMP TO LOW MEMORY IS SETUP, WE
  SET CLKADR TO THE ADDRESS OF CLOCK
        SHLD
                DMAADD
                                 : EXISTING CODE, NO CHANGE
                                  ; ADDED CODE BEGINS
        TF
                 CLOCK
                                 ; ADDRESS
        LXI
                H. CLK
        SHLD
                 CLKADR
        ENDIF
                                  ; END OF NEW CODE
 NOTE, WE DO NOT NEED TO PUT A JUMP INSTRUCTION IN
; NOW, AS THAT IS DONE BY THE TIME PROGRAM, WHEN
; THE CLOCK IS STARTED
  IN THE WARM BOOT AREA, WE CHECK TO SEE IF
; THE USER PROGRAM HAS TURNED THE CLOCK OFF
WBOOT:
        LXI
                SP,80H
                                 ; OLD CODE, NO CHANGE
        IF
                CLOCK
                                 ; NEW CODE STARTS HERE
                                  ; CHECK
        CALL
                INTON
        ENDIF
                                  ; END OF NEW CODE
        LDA
                DISKNO
                                  ; OLD CODE, NO CHANGE
; IN THE READ ROUTINE, SINCE MANY CONTROLLERS ARE NOT
; DMA, WE MUST TURN OFF THE INTERUPTS DURING THE
 ACTUAL READ PROCESS.
        XTHL
                                  ; EXISTING CODE, NO CHANGE
        XTHL
                                  ; EXISTING CODE, NO CHANGE
                                  ; NEW CODE STARTS HERE
        IF
                CLOCK
        DI
                                  ; KILL INTERUPTS
        ENDIF
                                  : END OF NEW CODE
        LDA
                                  ; EXISTING CODE, NO CHANGE
                SECTOR
 NOW, AS SOON AS POSIBLE AFTER WE HAVE COMPLETED THE DISK
  TRANSFER, WE WANT TO TURN THEM BACK ON
RDDONE: IN
                DSTAT
                                  ; READ DISC STATUS, OLD BIOS CODE
                                  ; NEW CODE STARTS HERE
                CLOCK
                                  ; CHECK
        CALL
                 INTON
        ENDIF
                                  ; END OF NEW CODE
 WE DO THE SAME THING FOR WRITE AS WE DID FOR READ
                                                          Listing 1 continued on page 484
```

```
: EXISTING CODE, NO CHANGE
       XTHL
                                ; EXISTING CODE, NO CHANGE
        XTHL
                              ; NEW CODE STARTS HERE
                CLOCK
        IF
                                ; TURN OFF
       DI
                                : END NEW CODE
        ENDIF
; AND AGAIN, BACK ON AS SOON AS POSIBLE
                               ; OLD CODE, NO CHANGE
        IN
               DSTAT
WDONE:
                                ; NEW CODE HERE
                CLOCK
        IF
                                ; CHECK - TURN BACK ON
        CALL
                INTON
                                ; END NEW CODE
        ENDIF
 THIS IS THE ACTUAL CLOCK SUBROUTINE TO BE ADDED TO THE BIOS.
  IT MAY BE PLACED ANYWHERE IN BIOS PROVIDING YOU DON'T BREAK
; UP A BIOS SUBROUTINE. A GOOD PLACE TO PUT IT IS AT THE END
; OF THE PROGRAM JUST BEFORE THE CBIOS MESSAGES.
 CLOCK TIME IS KEPT IN BCD FORMAT AND
  IN LINE CODE IS USED TO MINIMIZE STACK USAGE.
  (NOTE: THE 3RD AND 4TH LOCATION FROM THE
  START OF CLK, IS CHECKED BY THE "TIME" PROGRAM BEFORE
 TURNING THE CLOCK ON AND IT MUST BE THE SAME AS THE ADDRESS
  IN THE TIME PROGRAM USED FOR SECONDS.)
        IF
                CLOCK
                          ; SAVE USER
        PUSH
CLK:
                PSW
        PUSH
                Η
                                ; SECONDS
                H, SEC
        LXI
                                ; GET CURRENT
                A,M
        MOV
                                 ; + 1
                1
        ADI
                                ; BCD CORRECTION
        DAA
                                ; PUT IT BACK - DATA MAY BE GOOD
                M, A
        MOV
                                ; BCD FOR 60 SEC
                060H
        CPI
                                 ; OK, EXIT
                CLK2
        JNZ
                                ; A=0
        XRA
                A
                                ; RESET SECONDS, CHECK MINUTES
        MOV
                M, A
                                ; TO MINUTES
        INX
                H
                                ; CURRENT
        MOV
                1
                                 ; + 1
        ADI
                                   BCD CORRECTION
        DAA
                                 ; PUT IT BACK AGAIN
                M, A
        MOV
                                 ; BCD FOR 60 MINUTES
                060H
        CPI
                                ; OK, EXIT
         JNZ
                CLK2
                                 A=0
        XRA
                Α
                                ; RESET MINUTES, DO HOURS
        VOM
                 M, A
                                ; TO HOURS
         INX
                 H
                                ; GET CURRENT
        MOV
                 A,M
```

; + 1

: BCD CORRECTION

ADI

DAA

1

```
MOV
                 M, A
                                   ; OVERFLOW?
        CPI
                 013H
                 CLK2
        JNZ
                                     OK
                 M.001H
                                     SET TO 1 HR
        MVI
                                     TO AM/PM FLAG
        INX
                 H
        MOV
                 A, M
                                     GET CURRENT
        CMA
                                     REVERSE
                 M, A
        MOV
                                     NEW
CLK2:
        POP
                 H
                                     RESTORE
        JMP
                 INTON1
                                     DO ON/OFF CHECK
  THIS ROUTINE IS USED TO CHECK AND SEE IF THE
  INTERRUPTS SHOULD BE ON OR NOT, IT ENABLES THEM
  IF NECESSARY
INTON:
                 PSW
        PUSH
                                     SAVE
INTON1: LDA
                 ONOFF
                                     GET FLAG
        ORA
                                     AND TEST
                 A
                 INTON2
        JZ
                                     OFF
                                     TURN ON
        EI
INTON2: POP
                 PSW
                                     RESTORE USER
        RET
        ENDIF
```

#### ; THIS COMPLETES THE CODE ADDED TO BIOS FOR CLOCK OPERATION

ALTOS OUR LIST PRICE		Special! Apple Deals Call			
ACS8000-15 ACS8000-10 ACS8000-10SMTU	4990 8500 11990	3915 6665 9400	Ne Panasonic-		.Call
			Televideo		
TERM	IINALS	OUR	Systems	sCa	11
Add Managed	LIST	PRICE	DYNA	BYTE	OUR
Adds Viewpoint Televideo-910	650 699	599		LIST	PRICE
Televideo-910 Televideo 912C	950	CALL 695	5200 A2	3995	2995
Televideo 9120	950	995	5505 A1	6995	5229
XERO	X 820		5615 A1	8995	6650
ALIIC	A 020	OUR	5701 A1	8995	6950
	LIST	PRICE	PRIN	TERS	0110
System 1-51/4"			Phila	LIST	OUR
Disk Drive(s)	2995	2450	Diablo 630	2900	CALL
System 2-8"	1/27/DPEN	Section .	Qume Sprint	2895	2695
Disk Drive(s)	3795	3425	Okidata 82A	595	495
			Okidata 83A	940	765
Zenith-Z90-80	1		Epson-100	995	885
64K-1.2MB		All For 3690	Anadex 132	250	1350
with CP/M+microsoft	basic+	3690	Column DP9501	1650	1407
supercalc	10		NEC 3510	2290	1900
	t our N	Call for C Show	M-MP/M-Oasis So Price List Proom for a free De	ftware emo	1900
1	70 Broa	Busine adway, N	lew York, NY 1003		
	— WE	SHIP EV	-619-3360 /ERYWHERE! — ce & Support		
	-				
			ation at all times fardware Products		

#### Apple, Printers, Memory etc... **PRINTERS** NEC 8023A \$ MX-100 Parallel Card & Cable \$ 499.00 685.00 1200.00 **DISK DRIVES** Add on Drive for Apple (Tandom) Controller for Apple (Micro Sci) Shugart 801R (Sgl / Dbl) Shugart 851R (Dbl / Dbl) Qume DT-8 (Dbl / Dbl) \$370.00 89.00 389.00 525.00 499.00 **TERMINALS & MONITORS** Adds Viewpoint . . \$ Televideo 950C . 520.00 910.00 COMPONENTS Ea. 8 pcs 100 pcs \$1.90 2.20 3.90 4.60 6.95 6.95 1.50 7.00 2114L2 (200NS) 2708 (450NS) 2716 (5V) 2716 (5 & 12) 2532 (450NS) 2732 (450NS) 1.75 16-3 (150NS) We will try to beat all other Ad prices. We have available **SPECIALS** Apple II 48K Super R-Mod II 5¼ Disks (10 ea) \$1199.00 27.95 22.00 much, much more! ORDER DESK CALL Computer (213) 644-3311 Components Send Mail Order-VISA/MC, Unlimited Check, Wire Transfer P.O. Box 1936 / Hawthorne, CA 90250

Text continued from page 482:

temporary disk so that any mistakes won't wipe out your good disk.

Now assemble the BIOS file. If you have any errors, be sure to correct them before continuing. When the program assembles correctly, you will have two files: CBIOSXX.PRN and CBIOSXX.HEX. Transfer these two files along with SYSGEN (the CP/M command file that initializes new disks), CPMXX.COM (the command file for changing system size-sometimes called MOVCPM.COM). BOOT.HEX (the source file for the cold-start loader program), and DDT. You are now ready to add the new BIOS to your system. The following sequence shows how:

A > DDT CPMXX.COM (Call your file with DDT.)

DDT VERS X.X NEXT PC

2100 0100 (system response after loading)

ICBIOSXX.HEX

(Input your CBIOS hex file.)

-RXXXX

(This number varies. Check your manual for correct off-

set bias.)

NEXT PC (system response after loading CBIOS.HEX)

2286 0000

-IBOOTXX.HEX

(Input your BOOT hex file.)

-R900

(This offset number is always 900 for BOOT.) (system response after

loading BOOT.HEX)

2286 0000

NEXT PC

- ^C (Exit DDT with a warm boot.)

(Call SYSGEN and follow A>SYSGEN the prompts on your terminal to complete initializ-

ing the new system.)

Now it's time to try the new system. Put in your new disk and cold boot. If all is well, your system should run normally. Be sure to check out the CP/M operating system thoroughly to make sure you haven't added a bug somewhere. If the system crashes, one way to get a crosscheck is to print out the CBIOS.PRN file and compare it with your old listing. If the listings check, it is likely that you inserted some of the clock code in the wrong place. You'll have to do the BIOS over.

Once you get this far, the rest is easy. Call in your editor again and start a new file: TIME.ASM. This little program (listing 2) will reside permanently on your new

#### Annle Carde and Hardman

Apple Caras and Daraware
16K RamBoard by ConComp Industries 129
Hayes Micromodem II
Novation Apple-Cat
Videx Videoterm 80 Column card
Videx Keyboard Enhancer
Z-80 Softcard by Microsoft
16K RamCard by Microsoft
Thunderclock Plus clock/calendar card 129
Smarterm 80 column card
Corvus Winchester Hard Disk Drives CALL
ALF 3 Voice Music Card
ALF 9 Voice Music Card149
Lazer Lower Case Plus +
Lazer Keyboard Plus +
23 Key Numeric Keypad by Keyboard Co 120
Jovetick II by Keyboard Co
6809 CPU Card (The Mill) by Stallation 319
AIO Serial & Parallel Interface by SSM A&T 189
Music System (16 voices)
A/D + D/A Interface
Expansion Chassis (8 slots)
Introl X-10 Controller Card
Clock/Calendar Card
CPS Multi-Function Card
SuperTalker SD-200
Romplus + Card
Romwriter Card
Symtec Hi-Res Light Pen
Sup-H-Fan ventilation system for Apple II 45
Sup-H-Terminal 80 column card by M&H 329
SVA ZVX4 Megabyter 8" Disk Controller 645
SVA 2 + 2 Single Den. 8" Diek Controller 345
Speechlink 2000 by Heuristics
Versawriter Digitizer Tablet
Asynchronous Serial Interface card by CCS 139
Centronice Parallel interface card by CCS119
We carry all California Computer System Cards CALL
We stock many more items for the Apple II.
Please call or write for current price list.
a sense can or mine for current brice min.

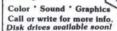
16K RAMBOARD by ConComp

for Apple II Computers

FOR ONLY \$99

### Personal

Computer



#### **Video Monitors**

129
49
89
LL
LL
LL
85
LL
269
85
49
39

#### Printers

Anadex 9501 w / 2K Buffer
C. Itoh Starwriter F-10
IDS Prism Printers
Epson MX-70
Epson MX-80 & MX-80 FT
Epson MX-100
NEC 803 Impact Dot Matrix 629
NEC Spinwriters (Latest models) CALL
Paper Tiger IDS-560G w/graphics 1099
Qume Sprint Dalsywheels (Latest models) CALL
Diablo 630 Daisywheel 40 CPS 1795

#### Software for the Apple

VisiCalc version 3.3
VisiFile (NEW data base manager)
VisiTrend/VisiPlot
VisiDex
VistTerm95
Desktop Plan II
DB Master
Wordstar (Apple 80-col version) by MicroPro 295
Easywriter Word Processor (80 col) 195
Tax Preparer '81 version
Real Estate Analyzer
Creative Financing
Personal Filing System (PFS)
Peachtree Accounting Software
BPI Accounting Software

#### Microcomputer



#### **CALL FOR** BEST PRICES

The NEC PC-8001A has all these features a more. Expandibility you want, expandability you get. Through the use of the PC-8012A I/O unit, total system RAM can be extended to 160K. The PC-8031 Dual Disk Drive puts 286K of floppy disk storage at your com-

nand.

The NEC PC-8001A has so many things that are op-ions on other computers built right in that you may have to buy another accessory! The quality that the lEC name has come to estand for has been built-in, too. Compare the competition, and then call Consumer omputers for the NEC PC-8001.

#### INVENTORY REDUCTION

#### SALE

Atari Educational Software								CALL
Apple Special Delivery Software								CALL
Alf 9 Voice Music Card						i.		.129
CCS S-100 64K Dynamic Rum C	ai	rel	i.					.449
CCS 9-100 4 MHz Z-80 CPU Care	đ							. 229
Centronics 737 Dot Matrix Print	ter	r						.499
Epson MX-70 Dot Matrix Printer							ı	. 299
Okidata 82-A Printer W / Tractor	٠.					•		.439
Sanyo 12" B&W Video Monitor								. 226
Sanyo 13" Hi-Res Color Monitor	۲.							.310

Call or write for special price list for INVENTORY REDUCTION SALE.

#### **ATARI 800 16K**



CALL FOR BEST PRICE

Atari 400 w/16K															349
410 Program Recorder															
810 Disk Drive															449
825 80 col. 7x8 Det matric	c fi	1	p		ci	1	pt	ń	mi	ta	T				699
822 40 col. Quiet Therma	P	H	'n	te	81	r									349
850 Interface Module															159
Atari 16K Ram Module					Ų.										. 69
Azlon Ramcram 32K Mod	mie														189

## ACCESSORIES

	_	_	_	_	_	_	_	_	_	7	_	_	_	_	
Card Expansion Chassis							•		•					٠	PRICES
Real-Time System Clock															BEST
Hi-Speed Serial I/O Card															FOR
Hi-Speed Parallel I/O Car															
236 K Dynamic Ram Card															CALL

Ordering information: Phone orders using VISA, MASTERCARD, AMERICAN EXPRESS, DINER'S CLUB, CARTE BLANCHE, bank wire transfer, cashier's or certified check, money order, or personal check (subset of the control of the

Send Orders To:



8338 Center Drive La Mesa, CA 92041

ORDER TOLL FREE 800-854-6654

In California and outside continental U.S.

(714) 698-8088

FREE SHIPPING

prepaid cash orders \* (continental US only) operating system disk. The coding is straightforward and heavily commented. After coding is complete, assemble the file and use the CP/M LOAD command to create the TIME.COM file on your new disk.

If you wired up the hardware on a kludge board, now is the time to install it. Power down and put in your board with the clock-disable switch OFF. Power up again and type the word "TIME" in response to the CP/M prompt. You can expect to see a garbled message, such as:

If you get this answer—with strange characters for time—all is well. The time characters are just junk put in

;

the time registers by the power-up start. "AM", "PM", or ": ", however, should appear in the proper position.

Now type in any valid 12-hour clock time. The display should read:

#### START CLOCK BY PRESSING RETURN

When you press return the display should read:

TIME IS SET TO = 12:00:00 PM (your set time)

If this message sequence doesn't occur, look for a problem in the TIME program. Fix this section before pro-

Text continued on page 492

**Listing 2:** TIME, a program that initializes the clock in the CP/M command mode. It resides permanently on disk and, when called, sets, starts, and stops the clock and reads the time. TIME may be called from any drive.

```
CLOCK PROGRAM BY J. L. CALAWAY & B. HILL
  FEB 10, 1981
                  LISTING #2, 03:35:40 PM
  COMMUNICATIONS AREA EQUATES
BASE
         EOU
                  040H
                                      COMM. AREA
CLKADR
         EOU
                  BASE
                                      ADDR OF CLK IN BIOS
ONOFF
         EOU
                  CLKADR+2
                                      ON=1, OFF=\emptyset
SEC
         EQU
                  ONOFF+1
                                      BCD SEC
MIN
                  SEC+1
                                      BCD MIN
         EQU
HRS
         EOU
                  MIN+1
                                      BCD HOURS
                  HRS+1
AMPM
         EOU
                                      AM=\emptyset, PM=1
RSTLC
                  Ø38H
                                      RST-7
         EOU
  CP/M ADDRESS EQUATES
ENTRY
                  00005H
                                      DOS ENTRY
         EOU
TAIL
         EQU
                  ØØØ8ØH
                                      COMMAND TAIL
  CP/M FUNCTION EQUATES
                  ØØ9H
                                      PRINT BUFFER
PMSG
         EQU
GCHR
         EQU
                  ØØ1H
                                      KEYBOARD
 ASCII EQUATES
CR
         EOU
                  ØØDH
                                      CARRIAGE RET
LF
         EOU
                  ØØAH
                                      LINE FEED
BELL
         EQU
                  ØØ7H
                                      BELL
                                      CP/M EOM
EOM
         EQU
                  Ø24H
         ORG
                  Ø100H
                                    ; CP/M TPA
  HERE WE BEGIN
START:
         LXI
                  D, CRLF
                                      CLEAR SCREEN
         IVM
                  C, PMSG
         CALL
                  ENTRY
  WHAT TO DO
  SHOW, SET, STOP
```

```
Listing 2 continued:
                                     ; COUNT
                  TAIL
         LDA
         ORA
                                     ; TEST
                  A
         JZ
                  DISP
                                     ; SHOW IF Ø
                  D, TAIL+1
                                     ; FIRST CHAR
         LXI
                                     ; COUNT
         MOV
                  L,A
         MVI
                  H,Ø
         DAD
                  D
                                     ; END
                                     ; A=Ø
         XRA
                  A
                                     ; EOF
         MOV
                  M,A
; SCAN TO FIRST NON-BLANK CHAR
;
SCAN:
         LDAX
                  D
                                     ; CHAR
         ORA
                  A
                                     ; EOM?
         RZ
                                     ; YES-SKIP
                  1 1
         CPI
                                     ; SPACE?
         JNZ
                  SCAN1
                                     ; NO
         INX
                  D
         JMP
                  SCAN
; NON-BLANK
SCAN1:
         CPI
                  Ø61H
                                    ; LOWER CASE
         JM
                  $+5
                                     ; NO
         SBI
                  Ø20H
                                     ; MAKE LOWER
                  'S'
         CPI
                                     ; STOP
         JZ
                  STOP
; LOOKS LIKE WE WILL SET TIME
 CHECK TO SEE IF BIOS HAS CLOCK
;
                  CLKADR
         LHLD
         INX
                  H
         INX
                  H
                                    ; TO ADDRESS
                  Η
         INX
         VOM
                  C,M
         INX
                  H
         MOV
                  B,M
                  H, NOT SEC-1
         LXI
         DAD
                  B
         VOM
                  A,L
         ORA
                  SCAN3
         JZ
         LXI
                  D, BIOSMG
                  C, PMSG
         MVI
                  ENTRY
         CALL
         RET
; CONVERT INPUT TIME
;
SCAN3:
        DCX
                  D
                                     ; BACK UP POINTER
; TEST
; Ø-9 TIME
; :/M SKIP
; A/B SET AM/PM
; SPACE = SKIP
; \emptyset\emptyset = END
                                     ; SRC
TEST:
         INX
                  D
                                     ; CHAR
                  D
         LDAX
         ORA
                  A
                                     ; END?
```

```
Listing 2 continued:
          JZ
                    FINI
          CPI
                    Ø61H
                                       : LOWER
          JM
                    $+5
          SBI
                    Ø20H
                                       ; CONVERT
                    101
          CPI
                                       ; NUMBER?
          JC
                   TESTI
                                       ; NO
          CPI
                    '9'+1
          JC
                   PACK
                                       ; VALID
TEST1:
          CPI
                    A
                                      ; AM
          JZ
                   SETA
                    'P'
          CPI
                                      ; PM
                   SETP
          JZ
                    " M "
          CPI
                                       ; JUNK?
          JZ
                   TEST
          CPI
                   1:1
                                      ; COLON
          JZ
                   TEST
                    1 1
          CPI
                                      ; SPACE
          JZ
                   TEST
ERROR:
          LXI
                                      ; NG
                   D, IVMSG
                   C, PMSG
          MVI
          CALL
                   ENTRY
          RET
; PACK INTO BCD
                   C,3
PACK:
          MVI
                                      ; TO DO
          PUSH
                   D
                                      ; SAVE
         LXI
                   H, BUFF+3
                   D,BUFF+2
         LXI
PACK1:
         LDAX
         RAR
         RAR
          RAR
         RAR
                                      ; SHIFT NIBBLE
         ANI
                   ØØFH
                                      ; CLEAR HIGH
         MOV
                   B,A
                                      ; TEMP
         MOV
                   A,M
         RLC
         RLC
         RLC
         RLC
                                      ; SHIFT TO HIGH
         ANI
                   ØFØH
                                      ; CLEAR LOW
         ORA
                   В
                                      ; COMBINE
         MOV
                   M,A
                                        SAVE
         DCX
                   D
         DCX
                   H
         DCR
                   C
                                      ; DONE
         JNZ
                   PACK1
         POP
                   D
                                      ; SRC
         LDAX
                                      ; GET NEW
                   D
                   ØØFH
         ANI
                                      ; TO BCD
         MOV
                   B,A
                                        TEMP
         INX
                   H
         MOV
                   A,M
         ORA
                   B
         MOV
                   M,A
         JMP
                   TEST
                                      ; NEXT
SETA:
         XRA
                  A
```

```
Listing 2 continued:
         JMP
                  SETAP
SETP:
         MVI
                  A, ØFFH
                  BUFF+4
SETAP:
         STA
         JMP
                  TEST
                                     ; CONT
; FINISH
FINI:
         LXI
                  H, TABLE
                                     ; TIME CHK
         LXI
                  D, BUFF+1
         MVI
                  C,3
FINI1:
         LDAX
                                     ; GET TIME
                  D
         CMP
                  M
         JNC
                  ERROR
         INX
                  D
                  H
         INX
         DCR
                  C
         JNZ
                  FINIL
         DCX
                  D
                                     ; MIN
         LDAX
                  D
         CPI
                  ØØ1H
                                     ; BCD 1 HR
         JC
                  ERROR
                                     ; HOLD OFF
         DI
         LHLD
                  BUFF+1
                                     ; COPY
                  SEC
         SHLD
         LHLD
                  BUFF+3
         SHLD
                  HRS
                                     ; SET VECTOR
         LHLD
                  CLKADR
         SHLD
                   RSTLC+1
                                     ; JMP
         MVI
                  A, ØC3H
         STA
                   RSTLC
         MVI
                   A, 1
         STA
                  ONOFF
                                     ; START
         LXI
                  D,STMSG
                                     ; ASK FOR A START
                  C, PMSG
         MVI
         CALL
                   ENTRY
                   C,GCHR
         MVI
                                     : GET KEY
         CALL
                   ENTRY
         LXI
                   D,TIMSG
                                     ; GIVE AN ANSYER
         MVI
                   C, PMSG
                   ENTRY
         CALL
         CALL
                   DISP
                                       SHOW
         EI
                                       INTERRUPTS ON
         RET
; TABLE OF MAX.
                  TIMES
;
TABLE:
         DB
                   Ø6ØH,Ø6ØH,Ø13H
; STOP CLOCK
;
STOP:
         DI
                                     ; INTERRUPTS OFF
         XRA
                  A
                                     ; A=Ø
         STA
                   ONOFF
                                     ; HALT
         LXI
                   D, STPMSG
         MVI
                   C, PMSG
         CALL
                   ENTRY
                                     ; TELL WHEN
         CALL
                  DISP
         RET
                                     ; BACK TO CPM
  DISPLAY TIME 12HR FORMAT
;
```

```
Listing 2 continued:
DISP:
         LXI
                   H, HRS
         LXI
                   D, BUFF
         CALL
                   DTIM
                                      ; SET UP
         LDA
                   AMPM
                                      ; AM OR PM
         ORA
                   A
                                      ; AM/PM
                   A, 'A'
         MVI
         JZ
                   DISP1
         MVI
                   A, 'P'
DISP1:
         INX
                   D
         STAX
                   D
         LXI
                   D, BUFF
         MVI
                   C, PMSG
         CALL
                   ENTRY
         RET
                                      ; QUICK TO CP/M
; DISPLAY TIME
DTIM:
         IVM
                   C, 3
                                      ; TO DO
DTIM1:
         VOM
                   A,M
                                      ; GET DATA
         RAR
                                      ; ISOLATE HI NIBBLE
         RAR
         RAR
                                      ; MSN
         RAR
         ANI
                   ØØFH
                                      ; CLEAR
                   101
         ORI
                                      ; TO ASCII
         STAX
                   D
                                        STORE IN BUFFER
         INX
                   D
         MOV
                   A,M
                                      ; LOW NIBBLE
         ANI
                   ØØFH
         ORI
                   101
         STAX
                   D
         DCX
                   H
                  D
         INX
         DCR
                   C
                                      ; DONE
         RZ
                  A, 1:1
         MVI
                                      ; ADD COLON
         STAX
                   D
         INX
                   D
         JP
                  DTIM1
; DATA AND MESSAGE AREA
;
                   BELL, 'NO CLOCK IN BIOS', CR, LF, EOM
BIOSMG: DB
                   BELL, 'INVALID TIME', CR, LF, EOM
IVMSG:
         DB
STPMSG: DB
                   'STOPPED AT ', EOM
                   'START CLOCK BY PRESSING RETURN ', EOM
STMSG:
         DB
                   CR, LF, 'TIME SET TO = ', EOM
TIMSG:
         DB
BUFF:
         DW
                                      ; DISPLAY DATA
         DW
                   Ø
         DW
                   Ø
                   0
         DW
                   ' AM'
         DB
CRLF:
         DB
                  CR, LF
CRLF1:
         DB
                   CR, LF, EOM
         DS
                   32
                                      ; ROOM
STACK
         EQU
                   $
```

END

Text continued from page 487:

ceeding.

Now again type 'TIME" in response to the prompt and the display should read:

#### A > 12:00:00 PM

At this point you should have a working clock. Turn on the disable switch in your clock board and go through the set-time sequence again. There should be a time change in the seconds column whenever you type "TIME" in response to the CP/M prompt.

Check out the minutes and seconds registers by setting the clock to 12:59:50. In 10 seconds, it should make the change to 01:00:00. If it does, congratulations! You now have a time-of-day clock—just like the expensive mainframe computers. If you have problems, then double-check your steps. This program has been thoroughly tested and should work.

If you program in BASIC, include one or two of the BASIC subroutines (listings 3, 4, and 5) in your pro-

grams. You will then be able to get a time readout whenever you want by simply calling one of these subroutines.

Note that there are two listings for reading the clock. Listing 3 is a program in Microsoft BASIC with the instruction HEX\$(X). Not all BASICs have this instruction, so there is an alternate clock read (listing 4), which does the same thing but less elegantly.

An interesting note here about the way that the HEX\$(X) instruction works: remember that the program stores the clock as a binary-coded-decimal number. For example, 25 seconds would be stored in the register as 0010/0101. The 2 is stored in the upper 4 bits and the 5 in the lower 4 bits. Due to the binary weighting of the 8 bits in the register, the HEX\$(X) instruction sees what it thinks is decimal 37. When called, the instruction dutifully returns the hexadecimal value of this number, or 25. Furthermore, it gives us that value as a string. Just what we need! Sneaky, isn't it? And very useful in cutting code down to size and setting up a printout.

Listing 5 is a short BASIC program that enables you to

**Listing 3:** A clock-read program in Microsoft BASIC. It can be used as a subroutine in a larger program to allow reading the clock when desired. This program makes interesting use of the HEX\$(X) instruction.

```
CLOCK PROGRAM BY J.L. CALAWAY & B. HILL
10 REM
20 REM
       FEB 12, 1981
                     02:20:47 PM
                                  LISTING #3
30 REM
40 REM
        READ CLOCK PROGRAM FOR BASIC WITH HEX$(X) COMMAND
50 REM
60 REM-----READ THE REGISTERS-----
70 REM
80
      T(1) = PEEK(69) : T(2) = PEEK(68) : T(3) = PEEK(67) : M1 = PEEK(70)
      IF M1=0 THEN M1$="AM" ELSE M1$="PM"
90
100 REM
110 REM----LOOP TO CHANGE REGISTER VALUES TO DECIMAL STRINGS-----
120 REM
130
       FOR I=1 TO 3
         IF VAL(HEX\$(T(I)))<10 THEN T\$(I)="0"+HEX\$(T(I))
140
              ELSE T$(I) = HEX$(T(I))
150
       NEXT I
160 REM
170 REM-----PRINT IT------
180 REM
       PRINT "TIME: ";T$(1);":";T$(2);":"T$(3);" ";M1$
190
200 REM
210 REM-----STORE AND/OR RETURN-----
```

**Listing 4:** A clock-read program for users who have a version of BASIC without a HEX\$(X) instruction. It works the same as listing 3, but takes twice as much code. It assumes that DIM(X) need not be used if X is less than 10.

```
100
         CLOCK PROGRAM BY J. L. CALAWAY AND B. HILL
    REM
110
         FEB 12, 1981
    REM
                        Ø3:05:19 PM
                                        LISTING #4
120 REM
130 REM
         READ CLOCK PROGRAM FOR BASIC WITHOUT THE HEX$(X) COMMAND
140 REM
150 REM-----READ THE REGISTERS------
160 REM
170
      T(1) = PEEK(69) : T(2) = PEEK(68) : T(3) = PEEK(67) : M1 = PEEK(70)
```

```
IF M1=0 THEN M1$="AM" ELSE M1$="PM"
180
190 REM
200 REM-----LOOP CHANGES HEX CODE TO DECIMAL STRINGS----
210 REM
220
       FOR I = 1 TO 3
230
          X=T(I)
240
          X = X - 16
250
        IF X<Ø THEN GOTO 290
260
           IF X<10 THEN T(I)=T(I)-6
270
              IF X>10 THEN T(I)=T(I)-6: GOTO 240
280 REM
         IF T(I) < 10 THEN T(I) = 0 +RIGHT(STR(T(I)),1)
290
           ELSE T$(I)=RIGHT$(STR$(T(I)),2)
300
       NEXT I
310 REM
320 REM-----PRINT THE STRINGS------
330
   REM
        PRINT T$(1)":";T$(2);":";T$(3);" "; M1$
340
350 REM
360 REM-----STORE AND/OR RETURN AS DESIRED-------
```

Listing 5: A BASIC program to set the clock by jamming a time into the clock registers. The clock has previously been started in the CP/M command mode and is running continuously. The program makes a cursory check for valid entries; an exhaustive examination for invalid time would require more code. The clock cannot be stopped and started from a BASIC program.

```
200 REM
         CLOCK PROGRAM BY J. L. CALAWAY & B. HILL
210 REM
         FEB 12, 1981
                         Ø2:23:07 PM
                                      LISTING 5
220 REM
225 REM
         BASIC PROGRAM TO SET TIME IN RUNNING CLOCK
23Ø REM
240
        LINE INPUT "WHAT TIME DO YOU WANT SET (HHMMSS(AM OR PM)"; T$
250
          IF LEN(T$)<>8 THEN PRINT CHR$(7); "INVALID TIME": GOTO 240
260
    T(1) = VAL(MID\$(T\$,5,2)): T(2) = VAL(MID\$(T\$,3,2)): T(3) = VAL(LEFT\$(T\$,2))
270
280
          IF MID$ (T\$,7,2) = "AM" THEN T(4) = \emptyset ELSE T(4) = 1
290 REM
300 REM-----LOOP TO CHANGE SET TIME TO BCD------
310 REM
320
          FOR I=1 TO 4
330
            X=T(I)
340
            X=X-10
              IF X<Ø THEN 38Ø
350
360
                IF X \le 9 THEN T(I) = T(I) + 6
370
                  IF X>9 THEN T(I)=T(I)+6: GOTO 340
380
             POKE 66+I,0+T(I)
390
           NEXT I
400 REM
410 REM-----PRINT/STORE OR RETURN AS DESIRED------
```

set the clock from BASIC. But this program doesn't start or stop the clock. The time code is simply jammed into the running clock registers.

Depending on your variety of BASIC, you may have to make a few more changes in the code. If you use CBASIC, for example, then you will have to add DIM statements to initialize the arrays. Or you could forget the arrays and simply use separate variables for the hours, minutes, seconds, and the AM/PM registers. If your BASIC requires the DIM statement, you may also have to initialize the arrays to 0.

While the BASIC listings serve as a starting point, you can embroider them as you wish. Maybe you would like to store the time in registers to be printed back later in the program. Perhaps you would like to display the seconds ticking away to add a sense of pressure to a favorite game program. Now that you have a clock, you can easily do such tricks. We hope you enjoy it.

#### SYSTEMS

#### Ace 100

Franklin Computer Corp. claims that its Ace 100 personal computer is 100% hardware- and softwarecompatible with the Apple computer. According to the company, all programs written for the Apple II, including high- and low-resolution black-and-white graphics, will run on the Ace without modification. Standard features include 64K bytes of RAM (random-access read/write memory) and a Videx Keyboard Enhancer. The Ace has an uppercase and lowercase 72-key typewriter-like keyboard and a 12-key numeric keypad

The Franklin Ace 100 is available for \$1595. Contact Franklin Computer Corp., 7030 Colonial Highway, Pennsauken, NJ 08109, (609) 488-1700. Circle 500 on inquiry card.

#### Expandable **Pocket Computer**

The Model PC-2 TRS-80 Pocket Computer features a BASIC interpreter with 42 statements, 34 functions, and 6 commands. The expandable PC-2 has full string-handling abilities with 80-character string length and two-dimensional arrays, a 26-character alphanumeric LCD (liquid-crystal display) with uppercase and lowercase characters, 2.5K bytes of memory, and a built-in realtime clock. Additional features include fully addressable 7 by 156 dot-matrix LCD graphics and a 60-pin I/O interface connector

Options for the PC-2 include an RS-232C interface and software, a four-color printer/plotter with nine different character sizes, and add-on RAM (randomaccess read/write memory) and ROM (read-only memory) modules. The PC-2 costs \$279.95. A 4K-byte memory module is available for \$69.95. Contact local Radio Shack stores, computer centers, and participating dealers, or the Tandy Corp., 1300 One Tandy Center, Fort Worth, TX 76102.

Circle 501 on inquiry card.

#### Wicat System 150

high-capacity Wicat System 150 includes an 8-MHz Motorola 68000 microprocessor (a 16-bit processor), memory, display screen, storage, and storage backup in a single desktop unit. The 150's main memory ranges from 256K bytes to 1.5 megabytes; standard mass storage includes a 10-megabyte Winchester hard-disk drive and a 960K-byte 51/4-inch floppy-disk drive for backup. The singleuser, real-time, multitasking 150 can be configured with 51/4-inch floppy disks or as an intelligent terminal without mass storage. The System 150 supports two RS-232C serial interfaces, a 16-bit parallel interface, and Pascal, C, APL, Ada,

COBOL, FORTRAN, LISP, WBASIC, and 68000 assembly languages.

Hardware options include a videodisc interface and a battery backup. Optional operating systems include Unix version 7 and a CP/M emulator. The Wicat System 150 ranges in price from under \$4000 for the intelligent terminal to \$8500 with the Winchester hard-disk unit. Contact Wicat Systems, 1875 South State St., Orem, UT 84057, (801) 224-6400.



#### **Desktop Computer**

The ACI-2 desktop computer features two highperformance 8-inch floppydisk drives and 64K bytes of RAM (random-access read/write memory). The Z80-based ACI-2 can run Digital Research's CP/M 2.2 software and interface with most industrystandard terminals, modems, and printers through three RS-232C serial ports. The ACI-2, which can be used with a modem for communications over telephone lines and as a smart timeshare terminal, is available for \$2995 from Alspa Computer Inc., 300 Harvey West Blvd., Santa Cruz, CA 95060, (408) 429-6000. Circle 503 on inquiry card.

#### **PUBLICATIONS**

#### Konan **Products Catalog**

Hard-disk drives and controllers, I/O controllers, cables, power supplies, and other items are listed in a free catalog of Konan products. Contact Konan Corp., 1448 North 27th Ave., Phoenix, AZ 85009. (800) 528-4563; in Arizona, (602) 269-2649. Circle 504 on inquiry card.

#### Understand Your VIC

Understanding Your VIC, Volume 1: Basic Programming is a step-bystep quide to learning about your Commodore VIC-20. Many of the book's exercises give the correct results so that you have feedback at your fingertips. The VIC's color and sound abilities can be mastered with the help of chapters that show you how to build demonstration programs with these features. Another chapter describes how the proper use of psuedocode and data dictionaries can help you refine programming problems.

Available in softcover for \$11.95, Understanding Your VIC, Volume 1 can be purchased from Commodore dealers or directly from Total Information Services, POB 921, Los Alamos, NM 87544, (505) 455-7049.

Circle 505 on inquiry card.

#### 8088 User's Manual

Intel's iAPX 88 Book details the 8088's architecture and discuss its 8- and 16-bit registers, megabyte memory-addressing modes, and instruction set. An overview of the 8088's key features, addressing techniques, and functional extensions is provided. A separate hardware section covers bus timing and interface considerations, interrupt handling, direct memory addressing, and interfacing memory and peripherals. Examples are given of multiplexed- and demultiplexed-bus personal and small-business computers, an S-100-bus-based design, and an 8088-based video-display controller.

The iAPX 88 Book costs \$7.50. Contact Intel Corp., Literature Dept., 3065 Bowers Ave., Santa Clara, CA 95051, (408) 734-8102. Circle 506 on inquiry card.

#### Microprocessor **Operating Systems**

Microprocessor Operating Systems provides indepth descriptions of National Semiconductor's BLMX-80, Intel's iRMX 80/88 and iRMX 86, Data General's MP/OS, Texas Instruments' Rx, Bell Lab's Unix. Motorola's VERSAdos, and Zilog's RIO/CP and ZRTS operating systems. The book is available for \$11.95 from Microcomputer Applications, POB E, Suisun City, CA 94585, (707) 422-1465.

Circle 507 on inquiry card.

#### Software **Business Review**

ICP Software Business Review analyzes software solutions to business problems for the corporate and data-processing executive. Existing and potential information-management problems are identified. and software solutions are proposed. Contact International Computer Programs, 9000 Keystone Crossing, Indianapolis, IN 46240, (800) 428-6179; in Indiana, (317) 844-7461. Circle 508 on inquiry card.

#### TI Logo Source

Microcomputers Corporation has a new catalog and a newsletter for Texas Instruments' TI-99/4A computer users. The bimonthly TI Logo Source newsletter is filled with reviews and news of the latest developments in Logo software. The catalog is packed with lists of available Logo programs. Both are free from Microcomputers Corp., POB 191, Rye, NY 10580, (914) 967-8370. Circle 509 on inquiry card.

#### Data Manual

The design and operation of the OB68K1 singleboard computer are described in a data manual available from Omnibyte. The OB68K1 computer system features the Motorola 16-bit MC68000 microprocessor on a Multibus/IEEE P796 bus and software compatibility with Motorola's MEX678KDM. The manual is available for \$10 from Omnibyte Corp., 245 West Roosevelt Rd., West Chicago, IL 60185, (312) 231-6880.

Circle 510 on inquiry card.

#### Microcomputer Buver's Guide

Webster's Microcomputer Buyer's Guide reviews more than 150 microcomputer systems from more than 50 suppliers. Individual chapters elaborate on the general topics of theory, applications, independent software vendors, and a wide range of display and printing terminals. The guide costs \$25, plus \$2.50 postage and handling. Contact Computer Reference Guide, 135 South Harper Ave., Los Angeles, CA 90048, (213) 852-4886. Circle 511 on inquiry card.

#### CP/M Users Software Directory

Vital Information's CP/M software directory is designed to aid hobbyists in the selection of software and peripherals. The directory contains more than 3000 entries, divided into 33 sections by subject. Program entries include publisher and list price. A toll-free hotline is available for subscribers who have software, hardware, or peripheral questions.

The directory costs \$19.95, plus \$1.50 postage. Contact Vital Information Inc., 7899 Mastin Dr., Overland Park, KS 66204, (800) 255-5119; in Kansas, (913) 381-1818. Circle 512 on inquiry card.

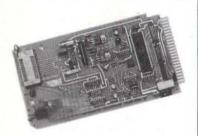
#### **PERIPHERALS**



#### Hide Your Modem

The MB10303 is a com-Bell-compatible 300-bit-per-second (bps) modem intended for spacesaving applications. It measures 5.8 by 5.75 by 2 cm (25/16 by 21/4 by 3/4 inches) and requires 33.5 square cm (51/2 square inches) of circuit-board area. It operates in full-duplex, manual originate, and manual or automatic answer. It interfaces at standard transistor-transistor logic (TTL) levels. Power requirements are 40 milliamperes (mA) at +5 volts (V) DC, 25 mA at +8 to +18 V DC, and 25 mA at -5 to -12 V DC. It can

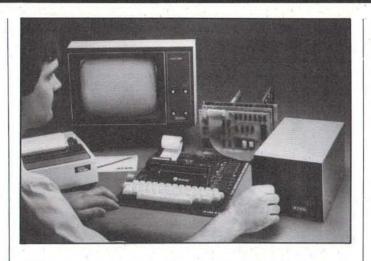
communicate with Bell System 103 and 113 series modems, with Bell 212A and Vadic 3400 series modems operating in the low-speed (300 bps) mode, and with acoustic-coupler data sets that use complementary signaling and handshake sequences. For further information, contact Micro-Baud Systems Inc., 3393 De La Cruz Blvd... Santa Clara, CA 95050. (408) 727-5275. Circle 513 on inquiry card.



#### Single-Card EPROM Programming

Giddings & Lewis Electronics' single-card EPROM Programmer Module is designed to program 2708 EPROMs (erasable programmable read-only memories). It doesn't require a special software-development system because it plugs directly into your production system. The module fits into a standard 114-millimeter- (4½-inch-) wide nest. The easy-to-use Programmer pulses each EPROM 100 times per byte; total programming time is 100 seconds per kilobyte of memory.

The EPROM Programmer Module costs \$295. Contact Giddings & Lewis Electronics, 142 Doty St., POB 590, Fond du Lac, WI 54935, (414) 921-9400. Circle 514 on inquiry card.



#### KIM-Compatible Mini-Disk Systems

Percom Data Company's MFD mini-disk storage systems for AIM-65, KIM, and SYM computers are available in one-, two-, and three-drive versions. The MFD systems are available in 40- and 80-track models and in both standard- and "flippy-" drive versions. The 40-track drive can store 102K bytes of formatted data; the 80-track drive stores 205K bytes.

An MFD system includes a disk-controller circuit card, a disk operating system (DOS) in ROM and on a disk, an interconnecting cable, user's manual, and disk drives. Two controllers are available: one for the AIM-65, the other for Percom's System-50 (SS-50) bus. Utilities and a 20-command library are supplied on the system disk. The DOS communicates directly with an Aim Monitor, Editor, BASIC, or other AIM program through your I/O and F1 and F2 keys.

The Percom MFD drive systems start at \$599.95.

An interface for connecting the drives to your computer costs \$49.95. Contact Percom Data Co., 211 North Kirby, Garland, TX 75042, (214) 272-3421. Circle 515 on inquiry card.

#### Paddle-Adapple

The Paddle-Adapple I/O expansion adapter lets software writers create fourplayer games with each player having paddle and push-button controls. Paddle-Adapple plugs into the Apple II's game port and works in two modes: the first lets you select between two devices plugged into the Apple; the second takes advantage of the Apple's ability to handle up to four game controllers. In either mode, the Paddle-Adapple's "jumper" sockets can be configured to meet designer needs, such as exchanging X and Y axes or reassigning push-button numbers.

The Paddle-Adapple is compatible with all Apple software and with most game I/O devices. The shift-

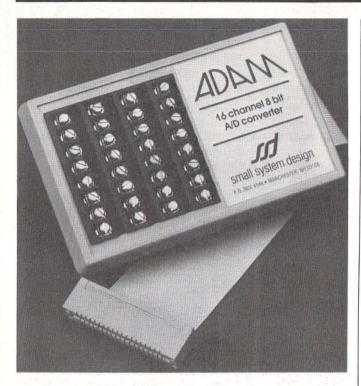
key modification is supported. It costs \$29.95 and is available from Southern California Research Group, POB 2231-B, Goleta, CA 93118, (805) 685-1931. Circle 516 on inquiry card.

#### Clock/Calendar Board

Columbus Instruments' IB-902AB interface card converts the AIM-65, PET. KIM. 6502, and 6800 computers into dedicated laboratory and industrial measurement systems. It contains a 12-bit A/D (analogto-digital) converter, a 16-channel multiplexer, a real-time clock/calendar with battery backup, and space for an additional 16K bytes of memory. The clock/calendar is crystalcontrolled to three seconds per month and provides time in seconds, minutes, hours, day of week, date, month, and year. A 12- or 24-hour clock is selectable, and programmable interrupts from 1024 per second to 1 per second are available. The onboard battery backup will provide the accurate time of day for up to four years. Conversion time of the A/D converter is 35 microseconds. Power requirements are ± 15 volts.

Supplied with demonstration programs for setting up the clock/calendar, reading analog channels, and addressing and testing memory, the IB-902AB costs \$1270. Contact Columbus Instruments, 950 North Hague Ave., Columbus, OH 43204, (614) 488-6176.

Circle 517 on inquiry card.



#### Adam Family

The Adam family of addon modules are designed to bring mini- and microcomputers into the world of data acquisition. The modules accept up to 16 analog inputs from a wide variety of analog devices and transducers such as temperature, flow-rate, and current sensors. The modules convert input voltage to digital values with a resolution of 8 bits.

Adam modules are available with either an interface for the TRS-80 Expansion Interface or with an RS-232C asynchronous interface. The TRS-80 version costs \$190: the RS-232C interface is \$250. For details, contact Small System Design, POB 4546, Manchester, NH 03108, (603) 432-7929. Circle 518 on inquiry card.

#### 5-Megabyte **Memory System**

The LS525, a 5-megabyte memory system, incorporates a Seagate ST506 51/4-inch Winchester harddisk drive, Logical Systems' LDOS disk operating system, a linear power supply, and the LSI 500 series controller. A separate host adapter provides crossconnections to different central processors and buses. All TRS-80 programs currently running under TRSDOS or NEWDOS will operate with LDOS.

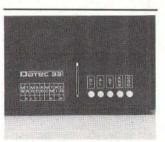
The LS525 costs \$3750. including a manual that details LDOS operations. Contact Laredo Systems Inc., 2264 Calle de Luna, Santa Clara, CA 95050, (408) 980-1888. Circle 519 on inquiry card.

#### To Alphasyntauri and Bach

The Alphasyntauri synthesizer is a modular instrument system that uses computer programs rather than hard-wired components to create and control sounds. Based on the Apple II microcomputer, the Alphasyntauri gives musicians an all-digital instrument that doesn't require programming or computer expertise.

An Alphasyntauri music system is made up of the Alphaplus operating system, instrument definitions, software utilities, a 61-note keyboard, foot pedals, and a computer interface. Mountain Computer's Musicsystem synthesizer provides 8-voice stereo polyphony. The complete system, including the Apple II, costs \$5000. The instrument alone costs \$2100. The Alphasyntauri is available from selected Apple dealers. A demonstration record costs \$2. Contact Syntauri Corp., 3506 Waverly St., Palo Alto, CA 94306, (415) 494-1017.

Circle 520 on inquiry card.



#### Bell-Compatible Modem

The Datec 33 is a 0- to 300-bit-per-second (bps) Bell-compatible originate/answer modem featuring a front panel voice/data button, long space disconnect, five diagnostic tests, and built-in "A" control. The modulardesigned rack-mountable modem will operate with any telephone over dial networks or over two-wire leased lines. The computerto-terminal interface is a standard RS-232C connec-

The Datec 33 has a suggested retail price of \$399 in a stand-alone version and \$325 for a card model. Contact Datec Inc., 300 East Main St., Carrboro, 27510, NC 19191 929-2135.

Circle 521 on inquiry card.

#### Joystick Interface

Joy-6 is a joystick interface for TRS-80 Models I and III that features push buttons, sound-effects capability, and control software. It can be used as a 6-channel analog-to-digital converter with temperature sensors or other transducers, and it can drive an external relay for control applications.

A complete Joy-6 package includes two joysticks with push buttons, power supply, user's manual, and the Joypak-1, a 16K-byte machine-language cassette packed with six joystick games. The Model III version requires an adapter cable. Joy-6 costs \$124.95; a kit version is available for \$99.95. Contact Mega Systems Inc., 262 Park Lane, King of Prussia, PA 19406, (215) 337-3876.

Circle 522 on inquiry card.



#### New Products from Commsoft

Commsoft's CW89 software package lets hamradio operators send and receive Morse code with their Heath H-8/H-19 or Heath/Zenith Z-89 microcomputers. The CW89 features a split-screen display, 4- to 99-word-per-minute operation, the ability to receive autotrack, a 1000-character pretype buffer, ten user-definable messages, a break-in mode, on-screen system status, disk I/O, hard-copy capabilities, and a codepractice section. All communications can be sent to a printer or stored on a disk. The CW89, which requires a hardware interface such as Commsoft's Codem, is available for \$99.95, postpaid.

The Codem interface is a universal continuous-wave ICWI interface that converts received CW audio into RS-232C or TTL signal levels and RS-232C or TTL signal levels to transmitter keying, so the Codem doubles as a code-practice oscillator and CW regenerator. The Codem costs \$124.95; a 9-volt DC power supply is \$9.95. A complete package consisting of the software. Codem, an interface cable, power supply, documentation, and shipping fees is available for \$249.95. Contact Commsoft, 665 Maybell Ave., Palo Alto, CA 94306, (415) 493-2184. Circle 523 on inquiry card.

#### **Modem Plus**

The Modem-Plus is a 1200-bit-per-second (bps) 202C/S-compatible modem for the S-100 bus. The address-selectable, originate/answer modem provides S-100 interface requirements, an on-board modem UART (universal asynchronous receiver/ transmitter) with selectable word format, hardwareautomatic pulse-dialing, 16-digit memory for redial, and modem sense and control lines using polling methods. Registered with the FCC for direct connection to the telephone system, the Modem-Plus is available in two models: one has a second on-board UART with selectable word format connected to a separate RS-232C I/O port; the other provides modem interrupts to the processor rather than the RS-232C port. The Modem-Plus is available for \$595 from Integrated Design Engineering Inc., POB 16307, St. Louis, MO 63125, (314) 487-1188.

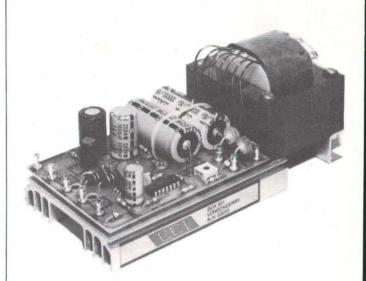
Circle 524 on inquiry card.

#### Get Into Warp Drive

The Warp Drive hardware and software package allows extendedaddress S-100 RAM (random access read/write memory) to emulate a disk drive under CP/M version 2.2, providing an increase in speed up to 40 times faster than floppy disks. The Warp Drive is based on Compupro's dual-processor 8085/8088 board. which allows as much as 1 megabyte of extendedaddress RAM to behave like a disk drive under CP/M-80 on the 8-MHz 8085 and to appear as directly addressable memory when running CP/M-86 on the 8-MHz 8088. All CP/M 2.2-compatible software runs on the Warp Drive without modifications.

The Warp Drive is available from G & G Engineering, 13708 Doolittle Dr., San Leandro, CA 94577, (415) 895-0798.

Circle 525 on inquiry card.



#### Multiple-Output Power Supply

The Model MP400 Power Supply can drive small line printers and lowcurrent floppy-disk drives. It provides outputs of +5 volts (V) DC at 5 amperes (A) with overvoltage protection, +12 VDC at 0.5 A, -5 V DC at 0.5 A, and +24 V DC at 0.75 A with a 1.2-A surge capability. The +5-V DC output is regulated to 0.1%; all others to 5%. Noise and ripple are less than 10 millivolts. The MP400 fits into

standard slope-front microprocessor enclosures and requires either 115 or 230 V AC ±10% input power. An aluminum heat sink maintains low ambient temperatures. The MP400 Power Supply costs \$72 in original-equipment-manufacturer quantities and is available from CEI Corp., Grenier Industrial Park, POB 501, Londonderry, NH 03053, (603) 623-8888. Circle 526 on inquiry card.

#### Microspeed

Apple II, II Plus, and III users can realize processing speeds up to 100 times faster than Applesoft BASIC with the Microspeed Language System. Developed from an extended FORTH. Microspeed is a hardware and software package that uses the Intel 8231A arithmetic processor and interactive compiler to provide enhanced programming capabilities such as print formatting, fast high-resolution and "turtle" graphics, and extended, highspeed mathematical functions.

System utilities include line- and screen-oriented text editors and a 6502 assembler. Each Microspeed comes with an auxiliary processor card, a user's manual, and two disks of software.

Two Microspeed configurations are available: Microspeed II, which uses a 2-MHz 8231A arithmetic processor, and Microspeed II + , which uses the newer 4-MHz 8231A. Microspeed Il costs \$495, Microspeed II+ costs \$645. The manual is available separately for \$35. Contact Applied Analytics Inc., Suite 200, 8910 Brookridge Dr., Upper Marlboro, MD 20772, (301) 627-6650. Circle 527 on inquiry card.

#### Mice in Your System

Upgrade your microcomputer to a development tool with MICE-Micro In-Circuit Emulator. A dualprocessor, two-board device with a built-in line

assembler and a two-pass disassembler, MICE features real-time emulation up to 5 MHz and an RS-232C interface for modems or terminals with data rates from 110 to 9600 bits per second.

MICE is available for 8085A, Z80, Z80A, Z80B, 6502. NSC800. 8048. 8049, and 8050 microcomputers. Prices range from \$1495 to \$5000. Obtain additional details from Microtek Lab Inc., 17221 South Western Ave., Gardena, CA 90247, (213) 538-5369.

Circle 528 on inquiry card.

#### Hollister Microsystems

Hollister Microsystems supplies interface boards, peripheral devices, and software for the Apple II, the IBM Personal Computer, and other microcomputers. For the Apple II. Hollister offers a 6800 cross-assembler on disk and an EPROM- lerasable programmable read-only memory) programmer/ EPROM card for programming 2716, 2732, 2732A, and 2764 EPROMs. Other products for the Apple include an EPROM/ROM simulator and a 24-bit parallel I/O card with highlevel-drive and master/ slave stacking capabilities.

For complete details on these and other products, contact Hollister Microsystems, 5081 Fairview, Hollister, CA 95023, (408) 637-0753.

Circle 529 on inquiry card.



#### No More Walting

If you're tired of waiting for your printer, plotter, or other peripheral to finish its job so you can get back to your computer, the Microcue may be what you've been waiting for. Microcue, a programmable Z80-based first-in, first-out (FIFO) device, accepts data from your computer and drives the printer from its own memory, freeing the host computer for other chores. A multiport Microcue can connect multiple printers and computers and select between them from switches or software control. The Microcue SP has serial and parallel ports and can convert from one to the other.

In addition to buffering, all Microcues are download-programmable, which allows for poll and select, code conversions, data formatting, modem operation, and interfacing to other systems. Present models have from two to eight ports and 16K to 32K bytes of memory. Prices start at \$299. Contact Microcompatible, POB 7624, Atlanta, GA 30357, (404) 874-8366. Circle 530 on inquiry card.

#### Apple Cat II

The Apple-Cat II is a large-scale integration (LSI) modem that converts your Apple II or II Plus computer into a functional telephone, complete with a handset. It can automatically answer, dial, re-dial, and disconnect a telephone call. Both Baudot and ASCII code are combined in this single add-on product. For the deaf and hearing impaired, a special 45.5-bit-per-second (bps)

Baudot-coded Weitbrecht modem is provided for use with teletypewriters (TTYs).

Data-transmission rates range from 50 to 1200 bps. Software is supplied on a floppy disk. A separate RS-232C serial port is provided, and the Apple Cat II also offers a 26K-byte memory-storage area and software controls that assure the accurate transmission of data.

An optional program chip provides compatibility

with many languages and operating systems, including BASIC, Pascal, and CP/M. The Apple-Cat II costs \$389 and is available from authorized Novation distributors. Contact Novation Inc., 18664 Oxnard St., Tarzana, CA 91356, (213) 996-5060.

Circle 531 on inquiry card.

#### 80-Column PET Adapter

Execom's 80-column adapter, circuit board, and ROM combination lets you switch the Commodore PET's 40-column display to an 80-column display from the keyboard or through program control. The kit contains a dual 24-pin socket, a circuit board that replaces the existing screen programmable memory, and an 80-column reference ROM that plugs into an expansion slot.

The circuit board and ROM combination is designed for the 2000, 3000, and 4000 series of PET/CBM computers that are designed for version 3.0 or 4.0 BASIC but do not have a video-display or a display-controller chip. The kit costs \$275; Execom will install the adapter for an additional \$75. An optional board that allows the ROM to be used with any other 2K-byte ROM in any expansion socket is available for \$25. For details, contact Execom Corp., 1901 Polaris Ave., Racine, WI 53404, (414) 632-1004.

Circle 532 on inquiry card.

#### Z65: Database Processor

The Z65 Database Processor is an applications development tool for the Apple II. It consists of a Z80 microprocessor, a 6502-to-Z80 software interface, and a Z80 implementation of the MDBS databasemanagement program, which is based on an extended-network data model. With the Z65, all applications development is performed within the Apple disk operating system using Applesoft BASIC. Database manipulations are handled by the Z80, which increases the 6502's speed.

With documentation, the Z65 package is available through a single-user license for \$1600. Without the Z80 card, the Z65 software costs \$1500, including documentation. Manuals can be purchased separately. For details, contact Micro Data Base Systems Inc., POB 248, Lafayette, IN 47902, (317) 448-1616. Circle 533 on inquiry card.

#### **MISCELLANEOUS**

#### Video Attributes Controller

The CRT 8021 Video Attributes Controller (VAC) works in conjunction with a character-generator ROM to provide video attributes and graphics for a display screen. An n-channel MOS/LSI (metal-oxide semiconductor/large-scale integrated) circuit, the 8021 processes and serializes

parallel data from the character generator for direct connection to the video input of a display-screen monitor. Attributes are added to alphanumeric data as you choose. The 8021 features both field and character attributes graphics modes, a 20-MHz video shift register, cursor, and separate data and attributes latches. Attributes include reverse video, character blink and blank, underline, and strike through. For more details, contact Standard Microsystems Corp., 35 Marcus Blvd., Hauppauge, NY 11787, (516) 273-3100.

Circle 534 on inquiry card.



#### Patch Set Monitors Line Signals

Syzygy's RS-232 Patch Set is a handheld device that connects inline with an interface cable, terminal, or modem. Designed for engineers and field-service personnel working with custom or nonstandard interfaces, the Patch Set's two 26-pin headers and jumpers permit line monitoring and full configuration of all 25 line signals. This lets the user completely define the configuration by means of jumper cables. The unit does not affect communications and is transparent to the line.

About the size of a business card, the Patch Set conforms to RS-232C standards and comes with ten 2-pin, four 3-pin, and one 4-pin jumper assemblies. The RS-232 Patch Set costs \$111. Contact Syzygy, 256 West San Bernardino Rd., Covina, CA 91723 (213) 332-3320.

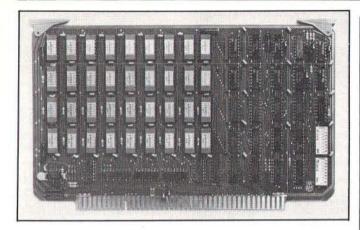
Circle 535 on inquiry card.

#### Flipper Flips Signals

A software-controllable switch that lets you switch voltage signals with simple software commands, the Flipper can be used between alternate video signals such as those generated by the Apple and an 80-column video board. The device plugs into the game port on the Apple and makes use of annunciator output zero (ANO). It allows unobstructed use of all the remaining functions for game I/O by providing a parallel game I/O connec-

The Flipper has two RCA phono jacks for input and one for output, and it can be arranged to have one jack for input and two for output. The board drains 30 milliamperes when the relay is energized. The Flipper costs \$50 and is available from Aurora Systems Inc., 2040 East Washington Ave., Madison, WI 53704, (608) 249-5875.

Circle 536 on inquiry card.



#### **Dynamic Memory Board**

The CI-6800-2 dynamicmemory board for the Exorcisor I and II and Rockwell International's System 65 plugs directly into existing Exorcisor connectors. Available in 16K-, 48K-, and 64 K-byte configurations, the board allows maximum processor throughput with the use of hidden-refresh control logic onboard. Data-access time is 225 nanoseconds (ns) and cycle time is 400 ns, which allows the board to operate as a static programmable memory at clock rates in excess of 1.5 MHz. For 2-MHz operation, the board can be configured to use a cycle-stealing refresh operation.

Onboard memory-select is available in 4K-byte increments to up to 64K bytes of memory. Another feature is onboard even parity with output jumperselectable to the system bus as a parity error or nonmaskable interrupt. The board's power consumption is under 7 watts.

Prices range from \$475 for the 16K-byte by 8-bit version to \$575 for the 64K-byte by 8-bit version. Contact Chrislin Industries Inc., 31352 Via Colinas #102, Westlake Village, CA 91361, (213) 991-2254. Circle 537 on inquiry card.

#### Remote Transmitter Controls Appliances

The BSR System X-10 Model TR274 remote telephone transmitter is a portable, calculator-size transmitter that is used in conjunction with a personal computer and your telephone. With the TR274, you can control any lights and appliances that are hooked up to your base station from any telephone, anywhere. The TR274

works with answering machines as well. The transmitter must be used with the TR270 telephone responder/controller. The Model TR274 telephone transmitter costs \$29.99. As a set, the TR274 and the TR270 cost \$99.99. Contact BSR Ltd., Rte. 303, Blauvelt, NY 10913, (914) 358-6060.

Circle 538 on inquiry card.

#### SOFTWARE

#### Package of Mysteries

The Applied Mysteries Package consolidates the information in H. C. Pennington's TRS-80 Disk & Other Mysteries into easily understood concepts. The package includes disassembled listings of bootstrap loaders with comments, descriptions of encoding methods that render floppy disks difficult to copy, a utility program for viewing a file's devicecontrol block, and procedures for disassembling system files. The Applied Mysteries package (booklet and floppy disk) costs \$17.95, plus \$2 postage. Contact Applied Softwares, 4316 Vermont Court, Virginia Beach, VA 23456.

Circle 539 on inquiry card.

## Print Diagrams of Your Projects

The expanded PMS-II project-management system has the ability to prepare net-change reports that compare the current status of a project to a previous status. In addition to critical-path analysis, data-management, and reporting capabilities, PMS-II can calculate gains and losses that can be displayed in both calendar and net working days format. Accommodating more than 1000 simultaneous activities for each project, PMS-II can calculate a critical-path schedule

based upon a three- to seven-day week, while omitting holiday periods.

PMS-II will operate with any microcomputer running under Digital Research's CP/M 2.2 operating system and Compiler Systems' CBASIC 2.07. Two 8-inch disk drives and a 132-column printer are required. PMS-II costs \$995. Contact North America Mica Inc., Suite 240, 11772 Sorrento Valley Rd., San Diego, CA 92121, (714) 481-6998.

Circle 540 on inquiry card.

#### Level II COBOL

Mainframe applications programs written to ANSI 74 COBOL standards can now be transported to microcomputers with minimal conversion thanks to Micro Focus Inc.'s Level II COBOL. The easy-to-install language fully meets the specifications set forth by the American National Standards Institute (ANSI) for Level II COBOL modules, including nucleus, table handling, sequential I/O, relative and indexed I/O, interprogram communication, and sort/ merge operations.

Level II COBOL is available for 8086-based computers and any computer with a C language compiler, such as the Z8000, the 68000, and the PDP-11. Contact Micro Focus Inc., 1601 Civic Centre Dr., Santa Clara, CA 95050, (408) 496-0176. Circle 541 on inquiry card.

Get In Synch

Synch is a 2780/3780 IBM binary synchronous software communications package for the Radio Shack TRS-80 Model II. Emulating 2770-, 2780-, and 3780-type bisynchronous work stations at data rates of up to 9600 bits per second, Synch supports transparency, buffer expansion from 128K bytes to 512K bytes, space compression, RVI (processor interrupt), and multipoint circuits. Synch provides lowcost RJE (remote job entry) capabilities and automatic features that allow up to 100 files to be arranged for unattended operations.

Including documentation, Synch costs \$500. Contact Westico Inc., 25 Van Zant St., Norwalk, CT 06855, (203) 853-6880. Circle 542 on inquiry card.

#### Quic-N-Easi Program Development

The Quic-N-Easi programming system ties together formatted and edited data entry with processing, printing, and filehandling capabilities including index-sequential, sequential, and randomaccess methods. The system features a screen builder, parameter-driven content editor, an interpreter language, and a print-format handler.

Quic-N-Easi will operated with most CP/M, Z80-based microcomputers with a minimum of 48K bytes and one disk drive. It costs \$395, including a selfteaching quide, reference manual, and reference card. Contact Standard Microsystems Inc., 136 Granite Hill Court, Langhome, PA 19047, (215) 968-0689.

Circle 543 on inquiry card.

#### Communications Software for Osborne

The Micro-Link communications package is designed exclusively for the Osborne 1's video-display screen. It uses the Osborne's RS-232C port with a standard modem to communicate over telephone lines with other computer users as well as with computerized bulletin boards and informationretrieval services. One such service, The Source, has organized an electronic mailbox for members of the Osborne Users Group. Originate and answer modes as well as full- and halfduplex operation are supported. Operating at 300 bits per second (bps), Micro-link allows files to be transmitted in character, line, or memory-block protocols. Files can be prepared in advance and transmitted automatically, and a complete two-way record of communication can be recorded in memorv and on disk.

With documentation and software on disk, Micro-Link costs \$89. Contact Osborne Computer Corp., 26500 Corporate Ave., Hayward, CA 94545, (415) 887-8080. Circle 544 on inquiry card.

#### Microline **Graphics Package**

Okidata's all-pointsaddressable graphics software package lets you create flowing lines and illustrations with any Microline printer. Each dot in the 60- by 66-dot-per-squareinch field is under your control. A software algorithm, supplied on floppy disk, lets you translate data displayed by an Apple computer into parallel data that can be used by the Microline printer. The Apple displays data in a 280 by 192 dot format, and the software sets it up proportionally for printing on a one-to-one basis.

The package consists of two programmable readonly memories (PROMs) and a floppy disk. It's available for the Microline Models 82A and 83A for \$100 at local dealers. As a standard feature on the Microline Model 84, the package provides a 72- by 72-dot-per-square-inch format. Contact Okidata Corp., 111 Gaither Dr., Mt. Laurel, NJ 08054. Circle 545 on inquiry card.

#### FORTH Source Code

A variety package of FORTH source code containing many previously unpublished FORTH definitions is available on an 8-inch disk from Timin Engineering. The package includes data structures, software-development aids, string manipulators, an expanded 32-bit vocabulary, a screen calculator, a typing practice program, and a menu generation/selection program. Also provided are examples of recursion, < BUILDS. . . DOES> usage, output number formatting, assembler definitions, conversational programs, 100 screens of software, and 100 screens of instructional documentation. The screens can be used with Timin FORTH or any other FIG (FORTH Interest Group) FORTH.

The variety package of FORTH source code costs \$75. Contact Timin Engineering Co., Suite E-2, 9575 Genesee Ave., San Diego, CA 92121, (714) 455-9008.

Circle 546 on inquiry card.

#### Entertainment **Products**

Arcade Machine, Red Alert, Track Attack, and Midnight Magic are four new entertainment products from Broderbund Software.

Arcade Machine lets you create arcade games for one or two players, featuring monsters, sound effects, automatic scoring, fast loading, and automatic boot to a title page with your name and your game's title in large graphic letters.

Red Alert requires a joystick, which helps you wield radar, ack-ack, and rockets to protect your base against an alien menace. Track Attack is a fastpaced, high-resolution game with color graphics, large-scale animation, and three train-robbery scenar-

### What's New?

ios from which to choose. The Midnight Magic highresolution pinball game has dual flipper controls, upper and lower playing levels, and a host of other effects.

The products range in price from \$29.95 to \$49.95. Each requires a 48K-byte Apple II with DOS 3.2 or 3.3. For details, contact Broderbund Software, 1938 Fourth Ave., San Rafael, CA 94901, (415) 456-6424.

#### Depreciation Planner

Circle 547 on inquiry card.

Designed for the Apple computer, the Depreciation Planner keeps track of depreciable assets for accounting and tax-planning purposes. Incorporating both pre-January 1981 depreciation methods and the new post-January 1981 depreciation methods, the Planner automatically calculates currentmonth depreciation, yearto-date, and life-to-date amounts. A modeling feature lets you experiment with all forms of depreciation for each asset. Lists of

items potentially eligible for investment tax credit in each fiscal year can be printed, as well as a depreciation-projection report listing current and following-year depreciation for individual assets. The Planner can provide a printed list of assets in five formats: tag numbers, location, depreciation type, depreciation method, and asset life.

Contact Dakin5 Corp., 7475 Dakin St., Denver, CO 80221, (303) 426-6090.

Circle 548 on inquiry card.

#### HP 83/85 File Manager

The Hewlett-Packard File

tures include report and graphics capabilities, builtin error trapping and recovery routines, and comprehensive dataintegrity checks. Each File Manager file can contain up to 1000 forms; each form can contain up to

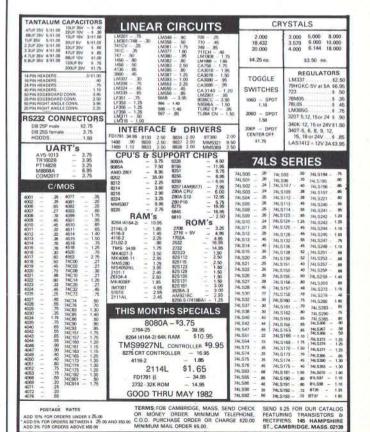
1000 alphanumeric characters.

The HP 83/85 File Manager Software Pac is supplied on 51/4-inch floppy disks and is available for \$200 at local Hewlett-Packard sales offices. Circle 549 on inquiry card.

Where Do New Products Items Come From?

The information printed in the new products pages of BYTE is obtained from "new product" or "press release" copy sent by the promoters of new products. If in our judgment the information might be of interest to the personal computing experimenters and homebrewers who read BYTE, we print it in some form. We openly solicit releases and photos from manufacturers and suppliers to this marketplace. The information is printed more or less as a first-in first-out queue, subject to occasional priority modifications. While we would not knowingly print untrue or inaccurate data, or data from unreliable companies, our capacity to evaluate the products and companies appearing in the "What's New?" feature is necessarily limited. We therefore cannot be responsible for product quality or company performance.

Manager Software Pac gives owners of HP 83/85 computers electronic filemanagement capabilities. The File Manager lets you create your own forms for entering data into the filing system. Data can be updated, searched, sorted, or even translated to a string data file for use with other software packages, such as Visicalc Plus. Other fea-



Pueblo, Colorado 81009. The American Economic System. We should all learn more about it.

TEST YOUR





"Economics,"

(Economics Quotient)

Write for a free booklet.

A public service message of This Magazine & The Advertising Council & U.S. Department of Commerce

TEL. (617) 547-7053 TOLL FREE 1-800-343-5230

### PRINTER SOLUTION



Handsomely crafted of heavy-duty ¼" Plexiglas. Permits easy, convenient storage of paper, checks, invoice forms, plus direct feed from shelf or surface below. A Programs Unlimited exclusive \$29.95

Regular Size 13" x 15" (Epson MX-80, Okidata u82, u83) Large Size 13" x 17" (Epson MX-100, Okidata u84) \$39.95

\$59.95 X-Large Size \$59.95 (Includes Shelf) 13" x 22" (Dataroyal, Paper Tiger) Optional Shelf \$14.95



**PROGRAMS** UNLIMITED

COMPUTER CENTERS 800-645-6038 In NY 516-997-8668

Circle 345 on inquiry card.



SAVE 40% complete list.

Write for our

51/4	10 or 16 sector
#744	1 side/sgl dens \$26.70
	1 side/dbl dens 31.20
#745	2 sides/dbl dens
8′′	Specify soft

or 32 sector #740 1 side/sgl dens...........27.30 #741 1 side/dbl dens . . . . . . . . . . . . . . . . . 35.80 

CHECKS - VISA - MC - C.O.D. (313) 777-7780 ADD \$2 SHIPPING

LYBEN COMPUTER SYSTEMS 27204 Harper Ave. St. Clair Shores, MI 48081

Authorized Distributor Information Processing Products



Circle 244 on inquiry card.



- A range of work stations designed specifically to house all micro-computers.
- Delivered heavily packed, in self-assembly form needing only a Philips screwdriver and a few minutes of your time to assemble.
   Manufactured from 1" all wood particleboard surfaced.
- with hard-wearing melamine veneer, in either Oak or

DEALER AND DISTRIBUTOR PRICES ON REQUEST FOR MORE INFORMATION WRITE OR CALL 301-223-8900

#### SUPER E-Z80 KIT

#### 64K-Z80A-CP/M™ Compatible Micro-Computer

Features: Z80A CPU-CTC and PIO • 64K Dynamic Ram • 4K Monitor EProm • 54 Key Keyboard (Detachable) • 3 Fully Buffered S-100 Spaces • Intergrated Circuit Sockets • RS232-C Asynch, Modem Control (Programmable Baud Rate) • Composite Video • CP/M™ Operating System Compatible . Epson or Centronics Printer Compatible Parallel Port • 8272 Floppy Controller Device - 3740 and 3741 Comp. - 8" & 5½" Drives - up to 4 Drives • Z80 Programming Card • As-sembly Instructions • Monitor Listing • Block Diagram.

PRICE: \$1195.00 **TERMS: Certified check or** 

money order (Texas Res. Add Sales Tax)

KIT-80 INC.

18601 LBJ Fwy. • Mesquite, Texas 75150 • 800-527-1593

Trademark of Digital Research

Circle 230 on inquiry card.

#### THE MISSING LINK



Adapt IBM ET50, 60, or 75 to Apple II or III with our Missing Link for word processing quality output.

Does not affect normal typewriter operation Typewriter still qualified for IBM maintenance con-

Interface isolates the Apple from the typewriter

See our full page ad in May 1980 BYTE Check with your local Apple dealer or to order call: 1-800-845-2712 (In S.C., call

1-800-922-5528) you need word processing software, we offer ManuScripter in two versions Beginner \$95, Advanced \$195

\*S C residents add 4% sales tax



Circle 89 on inquiry card.

#### PERSONAL COMPUTER SOFTWARE

for

#### EXECUTIVES and MANAGERS

- Name/Address/Key Information
- Personal Schedule
- Corporate Schedule
- Document Tracking
- File Indexing Schema .
- Tickler File
- Questionaire Tabulating

Any three for \$150 - All seven for \$250. Functional, well engineered software in the Pascal programming language for Apple II and TRS-80 Model II computers.

SOFTWARE CONSULTING SERVICES 901 Whittier Drive, Allentown, Pa. 18103 (215) 797-9690 ATT. Martha Cichelli

\*(TM) Apple Computer Co., \*\*(TM) Tandy Corp.

#### RS-232 PROBLEMS?



LET THE RS-232 TESTER HELP YOU SOLVE YOUR COMPUTER INTERFACE PROBLEMS. DESIGNED TO CONNECT PROBLEMS. DESIGNED TO CONNECT IN SERIES WITH ANY RS-232 INTERFACE, IT DISPLAYS THE STATUS OF SEVEN OF THE MOST IMPORTANT LINES: TRANSMIT DATA, RECEIVE DATA, REQUEST TO SEND, CLEAR TO SEND, DATA SET READY, CARRIER DETECT, AND DATA TERMINAL READY. THE RS-232 TESTER REQUIRES NO POWER AND MAY BE LEFT IN THE LINE PERMANENTLY.

\$39.95 POST PAID **B & B ELECTRONICS** 

**BOX 475/MENDOTA, IL 61342** 

Circle 37 on inquiry card.

### 

56 00

Entertainer Kit . . . . . 88.00 Programmer Kit

Communicator Kit \_320.00

Atari 400 16K Atari 410 Cassette 80.00

Atari 810 Disk . . 480.00

Microsoft Basic .... 72.00 **ALL ATARI SOFTWARE 20% OFF** Plus Loads of 3rd Party Software! VOTRAX TYPE'N'TALK: 340.00 ALSO EPSON & CENTRONICS PRINTERS

ZENITH & TELEVIDEO TERMINALS

BBI Mail Order is a company made up of computer professionals. We are able to provide low prices as well as technical support. Give us a call and find out why we consider the Atari the best home computer on the market today. You won't be disapointed.



#### **BBI Mail Order**

Specializing in Atari Home Computers P.O. Box 365 Newton Highlands, MA 02161 (617) 964 3080

Circle 42 on inquiry card.

#### HERE IT IS AT LAST!



#### "SUPERNET"

64K of memory, 280A CPU, Double Density Floppy Disk Controller, 2 Serial & Parallel I/O, monitor (EPROM) ALL on a single S-100 Computer Board from ADVANCED Micro Digital Corp.© THIS IS THE MOST UNIQUE S-100 COMPUTER BOARD:

	er Cable	 \$900. \$35.
Parallei Adar	oter Cable	 \$ 40.
	01R	\$ 455.
	2C	\$ 750.
	th 10 slots, power s for two 8 " floppies	\$ 650.
		\$ 650. \$10.00

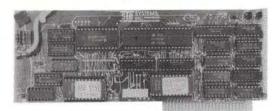
#### MICRO SPOT ELECTRONICS

14221 Edwards, Suite 72 Westminster, CA 92683 (714) 891-0382

#### TERMS:

Pre-Payment or C.O.D. up to \$250. (Cashler's check). Allow one week for checks to clear before shipping. Add \$5 shipping and handling charge to your order. Call. Residents add 8% sales tax.

### **IBM and APPLE COMPATIBLE BOARDS!** STB-80™ APPLE VIDEO BOARD



& TESTED

#### FEATURES:

\* 24 x 80 Display \* Direct Keyboard Entry for Lower Case and Special Characters

★ Line Graphics

★ Software Screen Switch to Standard Apple

★ Emulates all Basic Screen Formatting Commands

★ Compatible with PASCAL & CP/M

Software Controllable Inverse Video by Character & Screen

new

#### SOFTWARE

#1 DOS TOOL KIT PATCH DISKETTE This patches the APPLE EDITOR & ASSEMBLER for use with the STB-80.

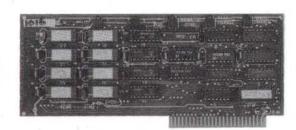
#2 APPLE WRITER PATCH DISKETTE This patches the APPLE WRITER WORD PROCESSOR package for use with the STB-80.

### APPLE MEMORY EXPANSION BOARDS STB-16™ 16K BOARD

- \* Assembled & Tested
- ★ Increases 48K to 64K
- ★ Compatible with PASCAL, CP/M DOS 3.3. PILOT, COBOL. FORTRAN, VISICALC, INT. BASIC. APPLE SOFT BASIC. etc.
- \* Easy to Install. Plug in and Go. No Cables. No chips to Remove.
- \* Expandable to 64K

164K UPGRADE FOR STB-16 IS \$1891

STB-64™ 64K BOARD



- \* Assembled and Tested
- ★ Uses 64K RAMS
- Four STB-16's on one Card
- Software Bank Selectable
- Compatible with 16K RAM Card Software
- DOS 3.3 Support Disk FREE with Purchase

### STB-128™ 128K APPLE BOARD MULTI-PURPOSE MEMORY BOARD & DISK EMULATOR

- 128K of Expansion Memory
- Includes DOS 3.3 Support Disk
- Eight STB-16's on one Card Processor Port for Direct Access Control
- ★ Uses 64K RAMS

COMING SOON: VISICALC EXPANSION SOFTWARE

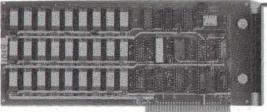
### STB DOS 3.3 SUPPORT PROGRAM DISK

- ★ Disk Emulator (1 STB-128 or
- 2 STB-64 Req) Disk "Cache" (1 STB-128 or 2 STB-64 Req)
- Fast Basic Loader
- Memory Tester
- DOS Relocater (Free 8K for Basic)

(FREE with STB-64 or STB-128)

★ Picture Flipper/Saver

IBM PC MEMORY EXPANSION BOARDS



PUT UP TO 256K ON LINE IN YOUR IBM P.C.!

64K — \$399 (STB-164)

128K — \$649 (STB-I128)

192K — \$799 (STB-1192) **ALL ASSEMBLED & TESTED** 

**EXPANSION KIT TO GO FROM 64K** TO 192K IS \$450

- ★ Expand Your IBM to 256K Using Only one Slot.
- ★ Available in 64, 128, or 192K Sizes
- ★ Easy to Install, Use in Any of the 5 Expansion Slots
- Mounting Bracket, Included for Secure, Reliable Operation
- Parity All Three Models Support Parity Error Testing
- One Year Limited Warranty on all Boards

IBM PC TM OF IBM CORP. APPLE AND APPLEWRITER TM OF APPLE COMPUTERS. CP/M TM OF DIGITAL RESEARCH. VISICALC TM OF VISICORP.

DIGITAL RESEARCH COMPUTERS IS PROUD TO BE ANNOUNCED AS THE NATIONAL MAIL ORDER OUTLET FOR THE FINE LINE OF S.T.B. "SIMPLY THE BEST" BOARDS.

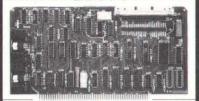
#### Digital Research Computers (OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Shipments will be made approximately 3 receive your order, VISA, MC, cash accepted. We will accept COD's with a \$75 deposit. Balance UPS COD. Add \$4.00 shipping.

USA AND CANADA ONLY

### FEEL TRAPPED BETWEEN CAPACITY AND



Processor Interface introduces the Cartridge Disk Controller for the S-100 bus. Configurable for 12 sector 2315 and 5440 type disk drives (1.25 - 10 Mbytes per drive) Complete with CPM\* CBIOS, disk formatter low cost \$595.00 diagnostics and technical manual

Manual only \$25.00 The performance you need at cost you can



Special (until 5/30/82)

ox 154A Elm Grove, WI 53122 Processor Interfaces, Inc. P

Circle 343 on inquiry card.

### PC/FORTH

Complete FORTH program development systems for the IBM® Personal Computer. Packages include interpreter/compiler with virtual memory management, line editor, custom screen editor, assembler, decompiler, utilities, file and record access modules, and many demonstration programs. 100 page user manual . . . \$100.00

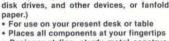
Floating point arithmetic extensions and cross compiler available at additional cost.

Ready to run under PC-DOS or CP/M-86® Standalone version available soon. 64 kbytes RAM and two disk drives recommended. (IBM is a registered trademark of International Business Machines Corp. CP/M is a registered trademark of Digital Research, Inc.)

#### **Laboratory Microsystems**

4147 Beethoven Street Los Angeles, CA 90066 (213) 306-7412

Circle 233 on inquiry card.



DESK TOP

VIDEO-PRINTER STAND

Get the benefits of specialized computer

furniture at a fraction of the cost.

. Designer styling, sturdy metal construction in Black or Beige

work space. (Works the same with printer,

Keyboard slides under

. For use with most micros and printers

**CROSS REF. PROGRAM** 

for

**MBASIC & BASCOM** 

Source Files

M80 and CP/M's ASM

MXREF will list all program variables,

functions, key words, strings, con-

stants and line number references in alphabetical order. 1000 variable names allowed. Requires an 8080 or

Z80 running CP/M ver. 1.4 or later and at least 48K RAM. Price \$96.00.

Manual only \$15.00. Add \$5.00 COD. MXREF available in CP/M format on

5" NorthStar or 8" single or double

COMPUTER TOOLBOX INC.

1325 East Main St.

Waterbury, CT. 06705

(203) 754-4197

density soft sector.

Circle 104 on inquiry card.

Introductory Price \$39.95 ea. Fla. add 4%

Dim: 191/2" • 12" • 63/4" Send CK or MO Including \$4.00 Shipping & handling

TV increasing

Advanced EFFORT-SAVER Products, Inc.

P.O. BOX 5001 HIALEAH, FL 33014

Circle 8 on inquiry card.

### SCR SUPER-BUYS

HANDLING/SHIPPING \$2.50

UPS ANYWHERE IN CONTINENTAL U.S.

#### 1982 BUYERS GUIDE NOT JUST ANOTHER CATALOGUE BUT A **BUYERS GUIDE** "OF THE FUTURE"

FREE

1. UHF-VHF CONVERSION KIT. Complete with PC board, all required components; jumper wire; cabinet with speak-er, and comprehensive brochure Incl. sche-matic, board layout, mounting and hook-up diagrams, parts list, and assembly and set-up instructions. All parts are industrial

\$119 95

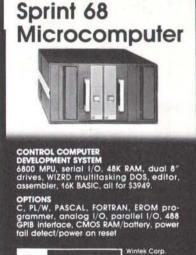
2. NEW ZENITH ZVM-121 HIGHoperator switch-selectable. Fully compatible

### SCR ELECTRONICS INC.

5303 Lincoln Ave., Cypress, CA 90630 Pay by CHECK M.O. VISA M/C

Circle 373 on inquiry card.

YOU CAN PAY MORE



Circle 438 on inquiry card.

### prime quality. LEGIBILITY CRT MONITOR. Feo-tures 12" green phosphor CRT, with 15 Mhz Bandwidth. 40 or 80 character widths are operator switch-serectuble. Fully Society With 80-column Apple cards, etc. OUTSIDE CAL. 800-854-8660 INSIDE CAL. (714) 527-2554 VISIT OUR NEW SUPER CENTER WINTER





51/4" Floppy Disk Drives

(single side-single or double density)

TANDON Model TM 100-1 \$219.95 ea.

2 or more - \$214.95 ea.\*

Floppy Drive Power Connector Kit \$2.00\* 5%" Memorex Floppy Disks - single side soft sector, single or double density - Box of

#### **CALL NOW - TOLL FREE**

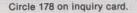
800-824-7888 all states except CA. 800-852-7777 for CA residents. Ask for Operator #99.

MC/VISA or C.O.D. with certified check or money order. Kansas residents add 3% sales tax.

\*Plus shipping. For info call: 316-683-9225 316-685-9445



923 Longfellow Street Wichita, KS 67207



### **Maxell Floppy Disks** The Mini-Disks



Dealer inquiries invited. C.O.D's accepted. Call

FREE (800) 235-4137.



PACIFIC EXCHANGES 100 Foothill Blvd., San Luis San Luis Obispo, CA 93401. In Cal. call (800) 592-5935 or (805)543-1037

Circle 320 on inquiry card.

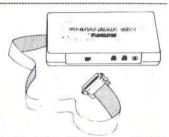




#### SPECIALS on INTEGRATED CIRCUITS 6502 7.45 10/6.95 50/6.55 100/6.15 6502A/6512A 8.40 10/7.95 50/7.35 100/6.90 6520 PIA 5.15 10/4.90 50/4.45 100/4.15 6522 VIA 6.45 10/6.10 50/5.75 100/5.45 10/7.40 6532 7 90 50/7 00 100/6 60 2114-L200 375 25/3 50 100/3.25 2114-L300 3.15 25/2.90 100/2.65 2716 EPROM 5/6.45 10/5.90 7.00 2532 EPROM 14.50 6116 Hitachi 2K x 8 CMOS RAM 14.50 4116 8 for 17 Zero Insertion Force 24 pin Socket 2.00 6550 RAM (PET 8K) 12.70 S-100 Wire Wrap Socket 240

A P Products 15% OFF A P Hobby-Blox 15% OFF





#### MODEM SPECIAL \$99

SIGNALMAN Mk1 from Anchor Automation

DIRECT CONNECT Modem with RS232 Cable and Connector included. Fully compatible with all Bell 103 modems. 0 to 300 bps, full duplex, frequency shift keyed modulation, automatic ANSW/ORIG selection, direct connect, audible tone carrier detect indicator, self-contained battery powered.

PET/CBM Version (Mk1P) \$169
For Commodore Computers, the Signalman Mk1P includes

connector, cable, and machine language software

 STAR MODEM
 Prentice/Livermore Data Systems

 RS232 MODEM
 SALE
 \$128

 IEEE 488 MODEM
 SALE
 \$199

 RS232 CCITT
 \$170

 IEEE 488 CCITT
 \$270

We carry Apple II+ from Bell & Howell



16K RAM	for Apple	95

CASH MANAGEM	ENT SYS	TEM	\$45
Easy to use. Keeps receipts, cash transfe			

FORTH for PET by Cargile/Riley	\$50
Full FIG model with all 79 Standard external	sions.
Metacompiler for FORTH for independent obje	ct code 30

KMMM	PASCAL 1	lor	PET/	CBM			\$85
Includes	translator	for	true	machine	language	object	code.

EARL for PET/CBM 65
Editor, Assembler, Relocator, Linkeditor.

SuperGraphics - BASIC Language Extensions 44 Fast Machine Language Graphics routines for PET/CBM.

### **G**commodore



CBM-PET SPECIALS	list	SALE
8023 Printer - 136 col, 150cps bi-directional	(995)	775
8300 Daisy Wheel - 40 cps bi-directional	(2250)	1750
8032 80 x 25 CRT, business keyboard	(1495)	1100
Super Pet	(1995)	1650
8096 Board (extra 64K RAM for 8032)	(500)	400
8050 Dual Disk Drive - 1 megabyte	(1795)	1345
8250 Dual Disk Drive - 2 megabyte	(2195)	1760
CBM IEEE Modem	(395)	199
4016 full size graphics keyboard	(995)	795
4032 full size graphics keyboard	(1295)	999
4040 Dual Disk Drive - 330,000 bytes	(1295)	999
2031 Single Disk Drive - 165,000 bytes	(695)	550
4022 Tractor Feed Printer	(795)	630
C2N External Cassette Deck	(75)	65
VIC 20 Color Computer	(299)	259
VIC 1515 Graphic Printer	(395)	335
Used CBM/PET Computers	13.5.4	CALL
8024-7 High Speed Printer	(1995)	1345
WE WILL MATCH ANY ADVEDTIG	ED DE	DICE

WE WILL MATCH ANY ADVERTISED PRICE

\*\*\* EDUCATIONAL DISCOUNTS \*\*\*
Buy 2 PET/CBM Computers, receive 1 FREE

#### PETSCAN I \$345 base price.

Allows you to connect up to 20 CBM/PET Computers to shared disk drives and printers. Completely transparent to the user. Perfect for schools or multiple word processing configurations.

7	ilgurations.					
	VIC 20	259	VIC Superslot	24		
	VIC 1515 Printer	335	VIC Super Alien	24		
	VIC 3K RAM	36	VIC Maze in 3-D	12		
	VIC 8K RAM	54	VIC Cosmic Debris	9		
	VIC 16K RAM	112	VIC Amok (UMI)	17		
	VIC 1540 Disk Drive	500	VIC Snakman	13		
	VIC Invaders	24	VIC Rubik's Cube	13		
	VIC Jupiter Lander	24	VIC Night Rider	11		
	TNW 1000 Serial Inte	rface		110		
	TNW 488/103 with D	AA		450		
	Compute!'s First Book	of PET	/CBM	11		
	WordPro 3 Plus - 32K	CBM.	disk, printer	195		
	WordPro 4 Plus - 803			300		
	OZZ Data Base System	m for C	BM 8032	335		
VISICALC for PET, ATARI, or APPLE						
	SM-KIT - PET ROM UN	lities		190 <b>40</b>		
	SM-KIT - PET ROM UN		OM Utilities	7.7		
		PET R		40		
	SM-KIT - PET ROM Util Programmers Toolkit -	PET R	itch	<b>40</b> 35		
	SM-KIT - PET ROM Util Programmers Toolkit - PET Spacemaker II RO	PET R	itch	40 35 36		
	SM-KIT - PET ROM UN Programmers Toolkit - PET Spacemaker II RO 2 Meter PET to IEEE	PET R OM Swi or IEEE	tch to IEEE Cable	35 36 40		
	SM-KIT - PET ROM UN Programmers Toolkit - PET Spacemaker II RO 2 Meter PET to IEEE Dust Cover for PET	PET REDM Swi	tch to IEEE Cable for PET	35 36 40 8		
	Programmers Toolkit - PET Spacemaker II RC 2 Meter PET to IEEE Dust Cover for PET IEEE-Parallel Printer II	PET REDM Swi	tch to IEEE Cable for PET	40 35 36 40 8 110		

#### RAM/ROM for PET/CBM

4K or 8K bytes of soft ROM with optional Battery Backup.

Adds extra RAM which can be write protected like ROM.

4K Version - \$85 8K Version - \$120 Battery Backup - \$30

**EPROM Programmer for CBM/PET** 79
Branding Iron with software/hardware for 2716 and 2532.

#### DISK SPECIALS



SCOTCH (3M) 5" 10/2.45 50/2.35 100/2.30 SCOTCH (3M) 8" 10/2.60 50/2.45 100/2.40

#### WE STOCK VERBATIM DISKS

Try the new Verbatim Head Cleaner Kits

BASF 5" or 8" 10/2.00 20/1.95 100/1.85 Wabash 5" 10/2.00 20/1.95 100/1.85 Wabash 8" 10/2.00 20/1.95 100/1.85

#### WE STOCK MAXELL DISKS

#### CASSETTES - AGFA PE-611 PREMIUM

High output, low noise, 5 screw housings.
C-10 10/.56 50/.50 100/.48
C-30 10/.73 50/.68 100/.66
All other lengths available. Write for price list.

### **SPECIALS**

**EPSON MX-80 Printer** EPSON MX-80 F/T Printer EPSON MX-70 Printer **EPSON MX-100 Printer** Centronics 739 Printer with dot graphics 575 STARWRITER Daisy Wheel Printer 1445 Zenith ZVM-121 Green Phosphor Monitor 119 Amdek Color Monitor 355 DC Hayes Smartmodem 240 Watanabe Intelligent Plotter 1195 6-Pen 1445 BMC BM12A Green Phosphor Monitor 105 BMC BM1400BLUC 13" Color Monitor 285

#### ALL BOOK and SOFTWARE PRICES DISCOUNTED

## Synertek Systems SYM-1 Microcomputer SYM BAS-1 BASIC or RAE 1/2 Assembler KTM-2/80 Synertek Video and Keyboard KTM-3/80 Synertek Tubeless Terminal 385



3	Z90-80 64 K	2.	2170
1	290-82 64K, 1 double dens. drive		2395
1	Z89-0 48K		1950
1	Z89-1 48K, 1 drive	- 1	2150
1	Z67 10 Megabyte + Floppy Drive		4495
1	Z37 1.3 Megabyte Dual Floppy		1495
1	Z25 High Speed Printer		1195
1	Z19 Video Terminal (VT-52 compatible)		670
1	ZVM-121 Green Phosphor Monitor		119
-	All Zenith Software discounted		





	/	SPEUL	WF2
800 Computer	695	Microsoft BASIC	72
400 - 16K	339	MISSILE COMMAND	32
810 Disk Drive	449	ASTEROIDS	32
825 Printer	629	STAR RAIDERS	32
850 Interface	175	Space Invaders	36
Inside Atari DOS	18	Music Composer	45
Paddle Pair	19	Chess	30
Joystick Pair	19	Super Breakout	30
16K RAM	69	PAC-MAN	36
32K RAM	99	CENTIPEDE	36
Pilot	68	First Book of Atari	11
Write for	prices or	other Atari items.	

WRITE FOR CATALOG

Add \$1.25 per order for shipping. We pay balance of UPS surface charges on all prepaid orders. Prices listed are on cash discount basis. Regular prices slightly higher. Prices subject to change.



Circle 215 on inquiry card.

### EPROM-32

The only EPROM programmer you need!

- IEEE-696 (S-100) EPROM programmer for single-supply (+5V) EPROMs.
   Programs current 1K through 8K (byte) EPROMs plus future 16K and 32K EPROMs.
- 16K and 32K EPHOMS.
  Personality Modules adapt board to different EPROM types:
  PM-1 2508, 2758 PM-4 2564
  2516, 2716 PM-5 2764
  PM-2 2532 PM-6 68764
  PM-3 2732 PM-7 2528(TI-16K)

- Zero-insertion-force socket accommodates both 24-pln and 28-pin EPROM packages. DIP switch selection of programming ports and EPROM
- address for verification and/or use.

  On-board DC-to-DC converter with adjustable regulator for programming voltage.
- programming voltage switched by software.

   Double-sided PC board with solder masks, silkscreen and gold-plated contact fingers.

   Documentation includes source listing of 8080/Z80 soft-
- ware for programming and verification

#### MicroDynamics

\$269.95 lasse

Corporation P.O. Box 17577 emphis, TN 38117 Memphis, TN 3811 (901)-755-0619

Price includes EPROM-32, documentation and two personality modules (specify). Additional modules—\$7.95. Programming/verification software on 8 inch single density CP/M-compatible diskette—\$9.95.

MASTERCARD & VISA-TN residents add 6% sales tax.

Circle 275 on inquiry card.





SAVE 40% Write for our complete list.

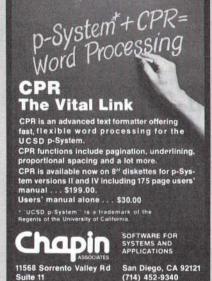
Write for our

5 1/4 " Specify soft, Price/10 10 or 16 sector side/single density . . . . . . . . . . . . \$26.70 2 sides/double density . . . . . . . . . . . . . . . . 37.10 8'' Specify soft or 32 sector 2 sides/double density . . . . . . . . . . . . . 41.60

> CHECKS - VISA - MC - C.O.D. (313) 777-7780 ADD \$2 SHIPPING

> LYBEN COMPUTER SYSTEMS 27204 Harper Ave. St. Clair Shores, MI 48081

Circle 242 on inquiry card.





EZ-TEXT will format & your text file the ay you want it 5-8" SD/DD

**Bower-Stewart** 

& Associates

POST OFFICE BOX 1389 HAWTHORNE, CALIFORNIA 90250

Trademark Digital Research



### Like-new products



For free catalog phone toll-free (800) 225-1008 In Massachusetts (617) 938-0900

GENSTAR REI SALES COMPANY

19527 Business Center Dr., Northridge, CA 91324

Circle 182 on inquiry card.



Double Your 5\" disk storage capacity without adding a drive.

Get twice as much from your H88 or H89 microcomputer. Our FDC-880H floppy disk controller, in conjunction with your 5\" drives, for example, expands memory capacity from 256 bytes to 512 bytes per sector.

And it handles single and doublesided, single and double-density, 8" and 51/4" drives - simultaneously.

Call 714/275-1272 today or write for details.

C.D.R. Systems Inc.

Controlled Data Recording Systems, Inc. 7667 Vickers St., San Diego, CA 92111

Circle 67 on inquiry card.

IEEE-488 TO TRS-80\* INTERFACE Everything needed to add powerful BASIC GPIB-488 controller capability to TRS-80 Model 1 or 3, Level 2 or DOS with a minimum of 16K.



488-80C For Model 3 Operation

488-80B For Model 1 Operation



Model 488-80B or 488-80C Price: \$375. WHEN ORDERING SPECIFY DISK OR TAPE

#### SCIENTIFIC ENGINEERING **LABORATORIES**

11 Neil Drive • Old Bethpage, NY 11804 Telephone: (516) 694-3370

\*Trademark of Tandy Corp.

There is no affiliation between Scientific Engineering Laboratories and Tandy Corp. or Radio Shack.

Circle 369 on inquiry card.

#### wny use tneir tiexipie aiscs:

Athana, BASF, Control Data, Dysan, IBM, Maxell, Nashua, Scotch, Shugart, Syncom, 3M, Verbatim or Wabash

### when you could be using

## **1EMOR**

### high quality error free discs?

Product Description	Part #	CE quant. 100 price per disc (\$)
8" SSSD IBM Compatible (128 B/S, 26 Sectors)	3062	2.09
8" SSSD Shugart Compatible, 32 Hard Sector	3015	2.09
8" SSDD IBM Compatible (128 B/S, 26 Sectors)	3090	2.74
8" DSDD Soft Sector (Unformatted)	3102	3.14
8" DSDD Soft Sector (128 B/S, 26 Sectors)	3115	3.34
8" DSDD Soft Sector (1024 B/S, 8 Sectors)	3104	3.34
8" DSDD Burroughs B-80 Comp., 32 Hard Sector	3092	3.34
51/4" SSSD Soft Sector (Unformatted)	3401	1.94
51/4" SSDD Soft Sector w/Hub Ring	3481	2.34
51/4" SSDD 10 Hard Sector w/Hub Ring	3483	2.34
51/4" SSDD 16 Hard Sector w/Hub Ring	3485	2.34
51/4" DSDD Soft Sector w/Hub Ring	3491	3.09
51/4" DSDD 10 Hard Sector w/Hub Ring	3493	3.09
51/4" DSDD 16 Hard Sector w/Hub Ring SSSD = Single Sided Single Density: SSDD = Single Sided Double Density	3495	3.09

#### Memorex Flexible Discs...The Ultimate in Memory Excellence

DSDD = Double Sided Double Density

Memorex means quality products that you can depend on, Quality control at Memorex means starting with the best materials available. Continual surveillance throughout the entire manufacturing process. The benefit of Memorex's years of experience in magnetic media production, resulting, for instance, in proprietary coating formulations. The most sophisticated testing procedures you'll find anywhere in the business.

#### 100 Percent Error Free

Each and every Memorex Flexible Disc is certified to be 100 percent error free. Each track of each flexible disc is tested, individually, to Memorex's stringent standards of excellence. They test signal amplitude, resolution, low-pass modulation, overwrite, missing pulse error and extra pulse error. They are torque-tested, and competitively tested on drives available from almost every major drive manufacturer in the industry including the competitive of the compe ing drives that Memorex manufacturers. Rigid quality audits are built into every step of the manmanufacturing process and stringent testing result in a standard of excellence that assures you, our customer, of a quality product designed for increased data reliability and consistent top performance.

Customer-Oriented Packaging Memorex's commitment to excellent does not stop with a quality product. They are proud of their flexible discs and they package them with pride. Both their packaging and their labelling have been designed with your ease of identification and use in mind. The desktop box containing ten discs is convenient for filing and storage. Both box labels and jacket labels provide full information on compatibility, density, sectoring, and record length. Envelopes with multi-language care and handling instructions and and color-coded removable labels are included. A write-protect feature is available to provide data security.

Full One Year Warranty — Your Assurance of Quality Memorex Flexible Discs will be replaced free of charge by Memorex if they are found to be defective in materials or workmanship within one year of the date of purchase. Other than replacement, Memorex will not be responsible for any damages or losses (including consequential damages) caused by the use of Memorex Flexible

Quantity Discounts Available
Memorex Flexible Discs are packed 10 discs to a carton and 10 cartons to a case. Please order only in increments of 100 units for quantity 100 pricing. We are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. Quantity discounts are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Memorex super low quantity 100 price. Almost all Memorex Flexible Discs are immediately available from CE. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Memorex compatibility hotline. Dial 800-538-8080 and ask for the flexible disc hotline extension 0997. In California dial 800-672-3525 extension 0997. Outside the U.S.A. dial 408-987-0997.

#### **Buy with Confidence**

Buy with Confidence
To get the fastest delivery from CE of your Memorex Flexible
Discs, send or phone your order directly to our Computer
Products Division. Be sure to calculate your price using the CE
prices in this ad. Michigan residents please add 4% sales tax.
Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge
for net 30 billing. All sales are subject to availability, acceptance
and verifications. All sales are final. Prices, terms and specifications are subject to change without notice. Quit of stock

and verification. All sales are linal. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Minimum order \$50.00. International orders are invited with a \$20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add \$8.00 per case or partial-case of 100 8-inch discs or \$6.00 per case or partial-case of 100 8-inch discs or \$6.00 per case or partial-case of 100 8-inch discs or \$6.00 per case or partial-case of 100 8-inch discs or \$6.00 per case or partial-case of 100 8-inch discs or \$0.00 per case or partial-case of 100 8-inch discs or \$0.00 per case or partial-case or \$10.00 \$1.00

Copyright "1982 Communications Electronics"

### High Quality **Error Free**

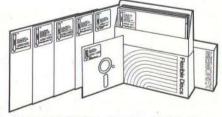








Order Toll-Free! (800) 521-4414



For Data Reliability—Memorex Flexible Discs



#### Computer Products Division

854 Phoenix 🗆 Box 1002 🗆 Ann Arbor, Michigan 48106 U.S.A. Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

### Got to expand?



#### Get a Giltronix Dual Switching System.

Expand and upgrade your 19" rack mounted dual switching system with a Giltronix Switching System #GDnS24. Superior design features: PCB technology for increased reliability ... Vertically mounted connectors for easy access ... Optional 3rd position and monitoring functions. For only \$139. Quantity discounts available. Dealer inquiries invited

#### SWITCH TO GITTRONIX



970 San Antonio Ave., Palo Alto, CA 94303

Circle 183 on inquiry card.



#### THE INFLATION FIGHTERS!

- 4116 300ns 8/\$11.00 4116 250ns 8/\$12.00
- 4116 200ns 8/\$13.00
- 4116 150ns 8/\$16.00
- 2114L 300ns 8/\$16.25
- 2114L 200ns 8/\$17.00
- \*4164 150ns \$7.90
- \*6116 150ns \$8.00

#### Z80A CPU \$5.50 ea. 8251A \$4.75 ea.

2716-1 (5V)350rs 8/\$7.00 ea. \$7.50 ea.

- 2716 (5V)450rs 8/\$3.75 ea.\$4.15 ea.
- \*2732 (5V)450ns 8/\$7.25 ea. \$9.00 ea. 2532 (5V)450ns 8/\$9.75 ea. \$10.00 ea.

Allow up to 3 wks. for personal checks to clear. Please include phone number. Prices subject to

change without notice.

Add \$3.50 Shipping & Handling

Wash. residents add 6.6% Sales Tax

P.O. Box 31607 Seattle, Wash. Zip 98103

Master Charge VISA accepted.

1-206-524-9126

Circle 74 on inquiry card.



### Got a computer?



#### Get a Giltronix Selector Switch.

Eliminate unplugging and re-plugging your CPU's, peripherals, and modems. Eliminate expensive duplication of interconnection hardware. Connect three components to Giltronix Selector Switch #S8AB. Then select your connection with a simple turn of the dial. Only \$79 in OEM quantities. Monitoring options available. Full 5 year warranty on all Giltroniy units

#### SWITCH TO GILTRONIX.

GILTRONIX, INC

970 San Antonio Ave., Palo Alto, CA 94303

Circle 184 on inquiry card.

### **PROFESSIONAL** MICROCOMPUTER



#### THE BEST VALUE ON THE MARKET

- Z80 4MHZ
- e 64K RAM
- DUAL 8" DRIVES
  - 1.2 MB STORAGE
- · 2 SERIAL I/O
  - 2 PARALLEL I/O
- · OPERATING SYSTEM AND UTILITIES MICRO BUSINESS ASSOCIATES, INC.

460 THIRD STREET

OAKLAND, CA 94607

415-839-5464

Circle 264 on inquiry card.

15/16"x3 1/2" 1 up - pin feed white pressure sensitive

#### PRICE INCLUDES SHIPPING

Packed 5M per box - Min. order 1 box -\$14.95 Check with order - Mass Residents add 5% Sales Tax

### CHECK-MATE

Box 103, Randolph, MA 02368 Telephone: 617-963-7694 CALL TOLL FREE 1-800-343-7706

Circle 71 on inquiry card.

### **Get Greedy!**



#### Get your TRS-80 a Giltronix Switching Unit.

Maximize price/performance by connecting your TRS-80 and two peripherals to Giltronix Switching Unit #GTRS-2AB-AP2. Then select your connection with a single turn of the dial. Eliminate duplicate interconnection hardware. Eliminate wasted time spent unplugging and replugging components. Offthe-shelf availability with a wide selection of I/O configurations. Call for your FREE product catalog. SWITCH TO GILTRONIX.

GILTRONIX, INC

970 San Antonio Ave., Palo Alto, CA 94303

Circle 185 on Inquiry card.

#### PLOTTING SOFTWARE

Calcomp compatible, for

EPSON and HIPLOT PLOTWARE-z 8" sssd ...399
Manuals only \* ...35
PLOTWARE-z samples \* ...6
\* Refundable on order 8" sssd ....399

E R C O M P B O X 2 8 0 1 4 e w o o d C o 1 o . 80228 303-988-1648 PLOTWARE-E



Circle 162 on inquiry card.



\$319.00 400 16K 400 YOURS to 32K or 48K . 800 (16K) ..... CALL 659.00 410 RECORDER 84 00 810 DISK DRIVE 449.00 850 INTERFACE 169 00 830 MODEM 149.00 825 PRINTER .575.00 481 ENTERTAINER KIT ...... .85.00 125.00 ..60.00 484 COMMUNICATOR KIT .309.00

> Prices subject to change without notice Shipping extra. No tax out of state. Ca. residents add appropriate taxes.

WE ARE AN AUTHORIZED ATARI SALES AND SERVICE CENTER



#### COMPUTERTIME, INC.

Kentfield, CA 94914

CALL TOLL-FREE 800-227-2520

Circle 108 on inquiry card.

### WE WILL NOT BE UNDERSOLD

	ALL SECTIONS OF THE SECTION AND ADDRESS OF THE SECTION ADDR	THE BUILDING HE STORE THE ST			
CP/M® Software	Software/Manual only	Apple Software (Entertainment)		Terminals	
Digital Research	6450/605	Wizard & Princess	\$ 28	ADDS Viewpoint	\$ Call
PL/I-80	\$459/\$35	Mystery House	\$ 24 \$ 32 \$ 29	Zenith Z-19	\$ 699
BT-80	\$179/\$30 \$ 85/\$15	Flight Simulator	\$ 32 \$ 29	Televideo 910	\$ 595 \$ 769
Mac Sid	\$ 65/\$15	Raster Blaster Space Eggs	\$ 26	Televideo 920C Televideo 950	\$ 769 \$ 969
Z-Sid	\$ 90/\$15	Sargon II	\$ 26 \$ 29 \$ 22	S-100 California Computer Systems	
Tex	\$ 90/\$15	ABM	\$ 22	Mainframe	\$ 349
DeSpool	\$ 50/\$10	Pool 1.5	\$ 26	Z80 CPU	\$ 239
Micropro	\$ 50,410	Beer Run	\$ 28	64K RAM	\$ 569
WordStar	\$319/\$60	Epoch	\$ 32	Floppy Disc Cntrl	\$ 339
Customization Note	s \$489/\$na	Sneakers	\$ 27	Integrated Sys. w/int. cables, tstd.	\$1975
Mail-Merge	\$109/\$25	Midnight Magic	\$ 32	2P + 2S I/O	\$ 269
WordStar/Mail-Merge		Wizardry	\$ 45	4 Port Serial I/O	\$ 249
DataStar	\$249/\$60	Apple Accessories		4 Port Parallel I/O	\$ 179
WordMaster	\$119/\$40	Z-80 Softcard by Microsoft	\$ 299	Casio Calculators	0405.00
SuperSort I Spell Star	\$199/\$40 \$175/\$40	Keyboard Enhancer	\$ 119 \$ 49		\$185.00 \$ 79.95
Microsoft	\$1757\$40	T & G Joystick Sup-r Mod	\$ 25		\$ 49.95
Basic-80	\$289/\$na	CPS Multifunction Card	\$ 199		\$ 49.95
Basic Compiler	\$329/\$na	Videoterm by Videx	\$ 249		\$ 69.95
Fortran-80	\$349/\$na	16K Card by Microsoft	\$ 159		\$ 59.95
Cobol-80	\$574/\$na	Sup-r Fan	\$ 39	Printers NEC Spinwriter	
M-Sort	\$124/\$na	ALF9 Voice Board	\$ 149	7710 R.O. Ser	\$2395
Macro-80	\$144/\$na	CCS Cards	\$Call	7710 Ser w/tr.	\$2595
Edit-80	\$ 84/\$na	CCS Parallel Model 7720	\$Call	7720 KSR w/tr.	\$2795
MuSimp/MuMath	\$224/\$na	CCS Serial Model 7710D	\$Call	7730 R.O. Par	\$2395
MuLisp-80	\$174/\$na	CCS Centronics Model 7728	\$Call	7730 R.O. Par w/t NEW 3500 Series	
Organic Software Milestone	\$269/\$30	Disk Drives For TRS-80* Model 1 CCI-100 51/4", 40 Track	\$ 299	Epson MX-70	\$ Call
Supersoft	\$203/\$30	Add-ons for Zenith Z-8		Epson MX-80	\$ Call
Diagnostic I	\$ 49/\$20	CCI-189 51/4", 40 Track		Epson MX-80FT	\$ Call
Diagnostic II	\$ 84/\$20	Z-87 Dual 51/4" system	\$ 995	Epson MX-100	\$ Call
Disk Doctor	\$ 84/\$20	Drives for Z-90	\$Call	Epson Graftrax	\$ Call
Forth (8080 or Z80)	\$149/\$30	External card edge and power included, 90 day warranty/one	er supply	PaperTiger 560 Gr. & 2K	\$ Call
Fortran	\$219/\$30	power supply.	e year on	IDS Prism 80	\$ Call
Fortran w/Ratfor	\$289/\$35	Corvus 5M	\$ 3089	IDS Prism 132	\$ Call
Unicorn	#140/#DE	Corvus 10M	\$ 4489	PaperTiger Access.	\$ Call
Mince Scribble	\$149/\$25 \$149/\$25	Corvus 20M	\$ 5429	Anadex DP-8000 Anadex DP-9500/01	\$ 949 \$1465
Both	\$249/\$50	Corvus Mirror	\$ 699	Okidata Microline 80 Fric. & pin feed	\$ Call
Data Base	Ψ243/Ψ30	Shugart 8" 801R Raw Drive	\$ 399 \$ Call	Okidata Microline 82A Fric. & pin feed	\$ Call
FMS-80	\$649/\$45	TANDON 51/4" Raw Drive Power Supplies	\$ Call	Okidata Microline 83A 120 cps	\$ Call
dBASE II	\$595/\$50	Diskettes — Box of 10	ψ Call	Okidata 84 200 cps	\$ Call
Access/80	\$699/\$50	Maxell 51/4"	\$ 40	Centronics 739	\$ 739
Pascal		Maxell 8"	\$ 45	Data South 180 cps	\$ Call
Pascal/MT+	\$429/\$30	BASF/Verbatim 51/4"	\$26.95	Monitors	
Pascal/M	\$189/\$20	BASF/Verbatim 8"	\$ 36	Leedex 12" B & W	\$ 119
Miscellaneous	\$299/\$25	Plastic File Box—Holds 50 5 1/4 " dskts.	\$ 19	Leedex 12" Green Screen Leedex 13" Color	\$ 129 \$ 329
SpellGuard SuperCalc	\$269/\$50	Plastic Library Case 51/4"	\$ 3	Sanyo 9" B&W	\$ 149
CBASIC-2	\$ 98/\$20	Plastic Library Case 8"	\$ 4 \$ 25	Sanyo 9" Green Screen	\$ 189
MicroStat	\$224/\$25	Head Cleaning Diskette Floppy Saver	\$10.95	Sanyo 12" Green Screen	\$ 249
StatPak	\$449/\$40	Floppy Saver Rings	\$ 6.95	Sanyo 12" B&W	\$ 239
Micro B+	\$229/\$20	16K RAM Kits	Ψ 0.00	Sanyo 13" Color	\$ 449
Apple Software (Bus	iness)	One Kit	\$19.00	Zenith 12" Green Screen	\$ 129
Micropro		Two Kits	\$37.00	Zenith 13" Color	\$ 349
Wordstar	\$289	200ns for TRS-80*, Apple II,			
MailMerge	\$119		s \$ 2.50	***** Special of the Month **	****
Wordstar/MailMerge SuperSort I	\$389 \$189	Computer Systems		Olivetti DY 211 Daisy Wheel	
Spellstar	\$139	Atari 400	\$ 359	\$Call	
Personal Software	\$105	Atari 800	\$ 699		
Visicalc 3.3	\$229	Call for other Atari products Zenith Z89, 48K	\$ Call	Telecommunications	
CCA Data Mgr	\$ 84	Zenith Z90, 64K	\$ Call	Prentice Star Modern 1-yr. guar.	\$ 125
Desktop/Plan II	\$229	Call for other Zenith products	Ψ Oun	Univ. Data System UDS103LP	\$ 135
Visiterm	\$139			Univ. Data System UDS103JP	\$ 189
Visidex	\$229	_ '		Novation Cat	\$ 139
Visiplot	\$185	For fast delivery, send certified che		Novation D-Cat	\$ 149
Visitrend/Visiplot	\$275	money orders or call to arrange dir bank wire transfers. Personal or co		Novation Auto-Cat	\$ 199
Zork Miscellaneous	\$ 34	checks require one to three weeks		Novation Apple Cat II	\$ 299
Micro Courier	\$219	All prices are mail order only and a		Hayes Smart Modem <sup>TM</sup>	\$ 249
Super-Text II	\$127	subject to change without notice.		Hayes Micro-Modem II <sup>TM</sup> Hayes Chronograph <sup>TM</sup>	\$ 310 \$ 225
ASCII Express	\$ 59	shipping charges.		CCI Telnet Com. Package	\$ 135
				Jiii i wallago	+ 100
Control of the Contro					

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED

### Send for FREE Catalogue

### The CPU SHOP

TO ORDER CALL TOLL FREE 1-800-343-6522

TWX: 710-348-1796 Massachusetts Residents call 617/242-3361

420-438 Rutherford Ave., Dept. B05M Charlestown, Massachusetts 02129 Hours 9 AM-9 PM (EST) Mon.-Fri. (Sat. till 6)

Technical Information call 617/242-3361 Massachusetts Residents add 5% Sales Tax Tandy Corporation Trademark/\*Digital Research





511

#### **ELIZA IS HERE!**

AT LAST! A FULL IMPLEMENTATION of the original ELIZA to run on your r

Created at MIT in 1986, ELIZA has become the world's most celebrated artificial intelligence demonstration program. ELIZA in an on-directive psychotherapies who analyzes each statement as you type it and then responds with her own comment or question — and her remarks are often startlingly appropriate.

Designed to run on a large mainframe, ELIZA has hitherto been unavailable to personal computer users except in greatly stripped down versions lacking the sophistication which made the original program so feacinating.

Now, our new microcomputer version possessing the FULL power and range of expression of the original is being offered at in-introductory price of only \$25. And if you want to find out at own does it (or teach her to do more) we will include the complete Source Program for only \$20 additional.

Order your copy of ELIZA today and you'll never again wonder how to respond when you hear someone say "Okay, let's see what this computer of yours can actually do!"

- ELIZA IS AVAILABLE IN THE FOLLOWING DISK FORMATS:
- Standard 8 Inch single density for all CP/M based computers \$25 for ELIZA.COM add \$20 for Microsoft BASIC-80 Source
- 5¼ Inch CP/M for Apple II equipped with Z-80 SoftCard \$25 for ELIZA.COM add \$20 for Microsoft BASIC-80 Source
- 5% inch for 48K Apple II with Applesoft ROM and DOS 3.3 \$25 for Protected File add \$20 for Unprotected Source

ARTIFICIAL INTELLIGENCE RESEARCH GROUP



921 NORTH LA JOLLA AVENUE 221 NORTH LA JOLLA AVENDE LOS ANGELES, CALIFORNIA 90046 (213) 656-7368 (213) 654-2214 MC, VISA and CHECKS ACCEPTED



Circle 28 on inquiry card.

### ANALOG 🖚 DIGITAL

Circle 170 on inquiry card.

command your own

STARSHIP

Fleet Maneuvers

play by mail game.

FANTANTIC SIMULATIONS

p. o. box 24566

denver colorado 80224

1982's hottest new

DIGITAL 🖚 ANALOG **CONVERSION MODULES** 

> SOFTWARE GAIN CONTROL

om 1 to 1024 16-ch onversion time

For additional details about the AD-100-4 and other fine California Data Corporation 100% individually tested, high reliability products, circle the reader service card number below or for faster response write or call us.

### CALIFORNIA DATA

CORPORATION 3475 Old Conejo Road, Suite Newbury Park, CA 91320 C-10

(805) 498-3651

### WANTED:

APPLE, IBM, TRS-80, CP/M

Westico is a publisher and distributor of professional software for microcomputers. If you have a new program ready for distribution or want your existing programs to reach a larger market, contact:

Phillip Woellhof, V.P. Mktg. Westico, Inc. 25 Van Zant Street Norwalk, CT 06855 (203) 853-6880

To increase your profits, take advantage of Westico's worldwide promotion and distribution

The Software Express Service

### SOFTWARE FOR CP/M®

dbase II

Ashton-Tate

DATABANK™

TM-DATA ACCESS CORPORATION

FOR OUR

Circle 11 on inquiry card.

CATALOG HARDWARE AND SOFTWARE FETCH COMPUTER PRODUCTS DIVISION OF ALMALY TRADING CORPORATION

8135 S.W. 17 STREET, MIAMI, FL 33155

TELEX: 51-9602 "ALMALY MIA" CALL TOLL FREE 800-327-2251

Apple is a Registered Trademark of Apple Computers CP/M is a Registered Trademark of Digital Research Circle 62 on inquiry card.

#### RAM: 64K-200ns (128 refresh) -

Color R.F. Modulator Kit: - \$9.95

14A S-100 Power Supply Kit-\$29.95

(for line cord and circuit breaker, add \$8.95) 47-63 Hz, 95-250 VAC with RFI filter included. ± 16V @2A

Enclosed versions now available for: NEC, IBM, Apple III (your choice). Call for Data.

#### Displays New! RGB

High Contrast Black-Stripe Tube
 Ultra Stable Convergence
 90 Day Warranty
 15.7 KHz

Microangelo CAT-100, IBM

13"- \$35900 525 x 420 lines, 32 lbs

19"-\$38900 525 x 620 lines, 48 lbs

Circle 134 on inquiry card.

(Displays 80 characters on IBM)
Active 12' Cable to IBM with "Intensity" Input—\$75.00

Dealin' Electronics

735 Loma Verde, Palo Alto, CA 94303 \* 415-493-5930

Dealerships Available

8/\$69

### OMEGA

#### The Last Disassembler You Will Ever Need!

Mnemonics Externally Defined

Zilog, Intel, PASM Supplied

ASCII/HEX Preconditioner

Can Externally Def. Equates

Optional Address Listing

ASM/PASM/M80 Compatible

DB statements forcible over user specified range

\$150. complete/\$25. manual only for further information contact

COMPUTER TOOLBOX, INC. 1325 East Main St. Waterbury, Ct. 06705 Phone (203) 754-4197

Circle 105 on inquiry card.

### Floppy Discs

SAVE 40% Write for our complete list.

5 1/4 " Specify soft, Price/10 10 or 16 sector MD525 1 side/dbl dens . . . . . . . . . . . \$27.30 MD557 2 sides/77 track......44.20

8" Critically Certified Soft sector

FD34-8000 1 side/dbl dens . . . . . . . . . 39.00 

CHECKS - VISA - MC - C.O.D. (313) 777-7780 ADD \$2 SHIPPING

LYBEN COMPUTER SYSTEMS 27204 Harper Ave. St. Clair Shores, MI 48081

Circle 243 on inquiry card.

### DISKETTES **CASSETTES**

Error-Free 51/4-inch Diskettes (MDsingle-sided, soft sector, single or double density, reinforced hub.

Item	Qty 10	Qty 50
MD-5	\$25.00	\$110.00
C-10	\$ 7.50	\$ 32.50
C-20	9.00	39.00
C-60	11.50	50.00
C-90	15.00	70.00

UPS SHIPPING INCLUDED in Continental USA CA Customers add taxes

### MICROSETTE

475 Ellis St., Mt. View, CA 94043 (415) 968-1604

Circle 279 on inquiry card.

#### CRT CONTROLLER



This intelligent CRT Controller uses an 8085A CPU & an 8275 Integrated CRT Controller. it features:

- 25 lines (80 char./line)
- 5x7 dot matrix
- Upper & lower case Two 2716's (controller & char.
- generator) Serial Interface RS232 & TTL Baud rates of 110, 150, 300, 600,
- 1200, 2400, 4800 and 9600
- Keyboard scanning system Unencoded keyboard required Uses +5V & ± 12V Power Sup-
- Does not have graphic capabilities.

Documentation includes program listing and composite video cir-

Bare Board only

(with doc) 2716 Char. Gen. A7 \$19.95 2716 Program A12 \$19.95

A-D CONVERTER

#### 6522 APPLE II INTERFACE



The JBE 6522 Parallel Interface for the Apple II Computer, plugs directly into any slot 1 through 7 in the Apple. This card has 2 6522 VIA's that provide:

- Four 8 bit bi-directional I/O
- Four 16 bit programmable timer/counters
- Serial shift registers

 Handshaking
 A 74LS05 is for timing. Four 16 pin sockets provide easy connections to other peripheral devices. (Dip jumpers with ribbon cables are also available from JBE) The 6522 Parallel I/O card interfaces to the JBE EPROM programmer.

Understanding of machine language required to use this board. Inputs and outputs are TTL compatible.

79-295A 79-295K 79-295B

\$69.95 Assembled \$59.95 Kit \$19.95 Bareboard

#### SPEECH SYNTHESIZERS



JBEs 16 channel A-D Converter plugs in-JBES IGENATION AD CONVERTER DUGS IN A DOOR AND LOST AND CORNER OF THE ADDRESS AND ADDRESS 5.12 volts. Conversion time is<100 usec.
The resolution is 8 bits or 256 steps,
linearity is ± 1/2 step. Two 16 pin DIP
sockets are used for input, GND &
reference voltage connections. There
are 3 single bitTTL inputs. Doc; Includes sample program,

81-132A Assm. 81-132K Kit 81-132B Bare Board

#### **EPROM PROGRAMMER**



JBE's EPROM Programmer is designed to program 5V 2516's, 2532's & 2716's. It interfaces to the JBE Parallel I/O card using four ribbon cables. An LED indicates when the EPROM is being programmed. A textool zero insertion force socket is used for the EPROM. Comes with complete documentation for writing and reading EPROM's in the Apple II or Apple II Plus. Cables available separately.

80-244A Assm \$49.95 80-244K Kit \$39.95 80-244B Bare Board \$24.95

#### PARTS

6502 MPU	\$9.95
6522 VIA	\$9.95
Z-80 MPU	\$9.95
Z-80 PIO	\$9.95
TWO2114 RAM	\$9.95
2716	\$14.95
50 pin conn.	\$5.95
DipJumper2ft.	\$4.95



JBEs Speech Synthesizers use the Votrax SC-01 Phoneme Syn-thesizer chip. The SC-01 phonetically synthesizes continuous speech of unlimited vocabulary. The SC-01 contains 64 different phonemes and 4 levels of inflection accessed by an 8 bit code. It requires 10 Bytes per second for continuous speech. Both boards have an audio amp for direct connection to an 8 ohm speaker.

Documentation includes basic user programs, a phoneme chart and listing of coded words to help you get started. Documentation for the Apple II® Speech Syn-thesizer includes a disk with many user programs.

81-088 Apple II Speech Synthesizer

\$139.95 81-120 Parallel Input Speech Synthesizer \$149.95 Prices include the SC-01 Chip SC-01 sold separately for \$ 75.95

#### **EPROM EXPANSION CARD**



JBE EPROM Expander for the Apple II holds six 5V 2716s for a total of 12K bytes of EPROM. This board takes the place of the on board ROM in the Apple. It is software switchable by the same technique used by the Apple II firmware card. Solder jumpers are for reset to the Apple ROM or EPROM Expansion Card. Use JBE EPROM Programmer and Parallel I/O to program your EPROMs. EPROMs sold separately.

81-085A Assm. \$59.95 \$49.95 81-085K Kit 81-085B Bare Board \$39.95

#### "SLIM" 81-260



Single board large scale Integration Microcomputer. This 4.5 x 6.5 board uses the Microprocessor, two 6522 VIA's. four 2114 RAM's, 2516, 2716 or 2532 EPROM. The fully buffered 22/44 pin bus is similar to the KIM®, SYM®, and AIM® expansion connector. The four 8 bit I/O ports connect through 16 pin dip sockets. This board was designed for control and is ideal for Personal and OEM use.

- 6502 MPU
- Two 6522 VIA's Four 2114 RAM's (2K bytes) One EPROM 2516 or 2532
- Crystal clock 1 Mhz Requires 5V 1AMP Power
- 4.5 x 6.5 card
- Power on reset
- Fully buffered-expandable
- Solder mask-both sides

Use your Apple II Computer, JBE 6522 Parallel Interface card and EPROM Programmer as a development system for SLIM.

Prices:

81-260A 81-260K 81-260B

\$199.95 Assembled \$149.95 Kit \$ 39.95 Bare Board

#### 6502 MICROCOMPUTER.



6502 MPU, 6522 VIA, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 400 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 1 Mhz clock.

Complete documentation, I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-153 Assm. \$110.95 80-153 Kit \$ 89.95 80-153 Bare Board \$ 19.95

#### Z-80 MICROCOMUTER

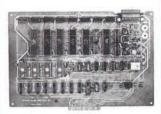


Z-80 MPU, Z-80 PIO, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 300 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 2Mhz clock.

Complete documentation, I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-280 Assm. \$129.95 80-280 Kit \$119.95 80-280 Bare Board \$ 19.95

10% OUTSIDE U.S.A.



JBE I MICROCOMPUTER

JBE's 7.75 x 11.75 6502 base Microcomputer has the capacity for 16K of EPROM. 4K of RAM, 8 Parallel Ports and 1 Serial Port. Monitor and Tiny Basic are also available. The fully populated version includes:

- 1 6502 CPU
- 4 6522 VIA (8 Parallel I/O Ports)
- AY5-1013 (Serial I/O Ports) • 8 2114 RAM (4K)
- 2 2716 EPROM (Monitor & Tiny Basic)

The partially populated version includes:

- 1 6502 CPU
- 1 6522 VIA (2 Parallel I/O Ports)
- 1 AY5-1013 (Serial I/O Port)
- 22114 RAM (1K)
- 2716 EPROM (with Monitor)

Both versions include sockets for 2716s or 2532s, 8 16 pin sockets for I/O interfacing and a DB25 connector for

All address and data lines are brought off the board to the 50 pin edge connector. (similar to the Apple II bus)

This board also features power on reset and cassette interface.

81-030 C Fully Populated \$349.95 81-030M Partially Populated \$249.95 81-030B Bare Board \$ 89.95 **2716 EPROM** 

(with Monitor) \$ 19.95 **2715 EPROM** (with Tiny Basic \$ 19.95





MC

### JOHN BELL ENGINEERING, INC.

ALL PRODUCTS ARE AVAILABLE FROM JOHN BELL ENGINEERING, INC. • 1014 CENTER ST., SAN CARLOS, CA 94070 ADD SALES TAX IN CALIFORNIA . ADD 5% SHIPPING & HANDLING 3% FOR ORDERS OVER \$100

SEND FOR CATALOG

(415) 592-8411 WILL CALL HOURS: 9am - 4pm VISA

#### ATTENTION SINGLE BOARD COMPUTER OWNERS

Complete your system with these fine products at savings from 15 to 25%.

Clock/Calendar for Digital Research's Big Board. Full time & date functions. Eight interrupts & battery backup. Bare board—\$25, Kit—\$54.95, Asm—\$67.95, Program diskette—\$5. Add \$2.50 postage.

Enclosures - Will house a computer board, keyboard, power supply, 12" monitor and 5" disk. 21"D X 19"W X 16" H. List \$105 Now Only \$89 + \$7 shipping

Monitors - 12" Motorola, 15 MHz, 800 line resolution. Separate video & List \$200 Now Only \$150 + \$4 shipping.

Call or write for other great specials. AB COMPUTER PRODUCTS, P.O BOX 571-B JACKSON, N.J. 08527, (201) 370-9889

Circle 3 on inquiry card.



For the '89

- · 3 MP/M II © Compatible Banks
- "Invisible Disk" CP/M Software Included

Only \$595.00

2264 - 15th AVE. W . SEATTLE, W/A 98119 [206] 285-7266 [800] 426-2841

CP/M® & MP/M II® are registered trademarks of Digital Research, Pacific Grove, CA.

Circle 248 on inquiry card.

ANNOUNCING THE FOX & GELLER

#### drase II PROGRAM **GENERATOR!** QUICKCODE\*\*

Now, without any programming, you can create these in seconds:

- MAILING LABELS
- WORDSTAR FORM LETTERS
- · DATA ENTRY/RETRIEVAL PGMS.
- dBASE FILES

#### \$295

INTRODUCING dUTILTM The dBASEII utility program. Automatically improves and comments your programs. Many other features.

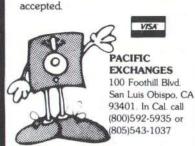
\$99 Fox & Geller

Teaneck, NJ 07666 (201) 837-0142

P.O. Box 1053 dBASE-II TM Ashton-Tate Wordstar TM Micropro Int'I

### **MEMOREX** FLEXIBLE DISCS

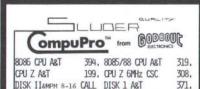
WE WILL NOT BE UNDER-SOLD!! Call Free (800)235-4137 for prices and information. Dealer inquiries invited and C.O.D.'s



Circle 320 on Inquiry card.



Circle 399 on inquiry card.



INTERFACER 3 (5) 449, RAM 16 A&T 64K 671. LOMAS DATA PRODUCTS LIGHTING 1 8086 399, LDP72 DISK CONTR, 195.

HAZITAL 2ser, 2p 260, MSDOS OR CPMTM86

RAM 128K A&T 650. RAM 256K A&T 1099. **SEATTLE COMPUTER** 8086, SUPPORT CARD & 86DOS ONLY 629,

#### RAM 64K STATIC 746. IBM 256K ADD-ON

699. MORROW DESIGNS

#### DECISION 1 BASIC 1295, DMA DJ w/CPMTM 356.

RAM 65K STATIC 581. MULTI 10 DUAL 8" 801 & CAB 1056, DUAL 8" 850 & CAB 1496,

ALL PRICES SUBJECT TO CHANGE SHIPPING HIN 3. CPM IS A TRADEMARK OF DIGITAL RESEARCH OF CA. POLICE TO THE PROPERTY OF THE PROPE

### Personal **Publishing**

If you have ever thought about publishing your memoirs, the Great American Novel, your PhD thesis, documentation for a computer program, or whatever; think about Intergraphics' Personal Publishing service. It is the lowest cost method yet devised to get your words into print. Your Personal Computer, a modem, and a little "do-it-yourself" spirit are all that is necessary to access our fully automated computerized typesetting service. For further information, write to:

Intergraphics Inc.

106A South Columbus Street Alexandria, Virginia 22314

Circle 212 on inquiry card.





- **SYSTEMS**
- COMPONENTS
- **PRINTERS**
- SOFTWARE
- SERVICE ADD-ONS

For Pricing and Catalog Call or Write



Development Systems Co. 2100-A Walsh Ave. Santa Clara, CA 95050 Phone: (408) 727-1549

Circle 139 on inquiry card.

### TRS-80™ Models 1 & 3

**SMART TERMINAL......\$69.95** Model 2 (CP/M) Version ... \$79.95 Enables your TRS-80 to be used as a data communications terminal to a time-sharing system or to another computer. Automatic transmission or storage of data to/from other computer. Control keys, character mapping, true BREAK key. Cassette and disk files compatible with Electric Pencil™ and Scripsit™. Transmit/receive with verification.

SYSTEM DIAGNOSTIC ..... \$94.95 Complete diagnostics for every component of your TRS-80. Separate tests for ROM, RAM, video display, keyboard, line printer, cassette recorder, disk drives, RS-232-C interface

Add \$5.00 for program supplied on diskette, \$3.00 postage and handling. S.A.S.E. for FREE catalogue.

#### HOWE SOFTWARE

14 Lexington Rd., New City, NY 10956 (914) 634-1821

## AUG ELECTRONICS

FULL LINE ALL PARTS & COMPUTER PRODUCTS

P.O. Box 4430X Santa Clara, CA 95054 Will calls: 2322 Walsh Ave. (408) 988-1640

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

#### INTEGRATED CIRCUITS

#### Phone orders only (800) 538-8196

7400TTL 7400N	19	LM317T LM317K	1.65	CD4017 CD4018	1.05		1.69	UART/FIFO AV5-1013	3.95	DE9S DA15P	1.95	
7402N 7404N 7409N	19 22 19	LM318 LM320K-5 LM320K-12	1.49 1.35 1.35	CD4019 CD4020 CD4021	45 95 95	8197 8198 MOS/MEMORY	99	AY5-1013 AY5-1014 3341	6.95 6.95	DA15S Complete Set Sterwatch Kit	3 10 9.50 26.95	
7410N 7414N	19	LM320K-15 LM320T-5 LM320T-8	1.35 85 85	CD4022 CD4023	1.10 28 75	2101-1 2102-1	1.95	PROM 1702A 2532	4.50 17.50	Auto Clack Kit Digital Clock Kit	17.95	
7420N 7430N 7442N	19 19 49	LM320T-12 LM320T-15	85 85	CD4024 CD4025 CD4026	23	2102AL-4 2102AN-2L 2104A-4	1.25	2708 2716T1 2716 5 Voit	2.95 8.50 5.50	RESISTORS 14 w 10 per type	.05	1981 IC
7445N 7447N 7448N	69 69	LM323K-5 LM324N LM339N	4,95 59	CD4027 CD4028	65 80 95	2107B-4 2111-1	3.75		39 00 16.50	1000 per type 1000 per type 5000 per type	.015 .012 .0085	MASTER
7474N 7475N	69 35 49	LM340K-5 LM340K-8	1.35	CD4029 CD4030 CD4035	45 85	2112-2 2114 2114L 300nn	2.99 2.24 2.50	2758 8741A 874R	7.49 39.95	350 piece pack 5 per type		\$59.95
7485N 7489N 7490N	1.70 35	LM340K-12 LM340K-15 LM340K-24		CD4040 CD4042	95 75 85	2114L 450ns 4116 200ns	2.37	8748-8 8755A	39.95 34.95 49.95	1/2 watt 5% per	type .05.	
7495N 74100N	1.00	LM340T-5 LM340T-8	75 75	CD4043 CD4044 CD4046	85 95	8/4118 200ns MM5280 MM5321	3.00 9.95	N82S23 N82S123	2.95 3.95	4-position 5-position	85 90	
74107N 74123N 74125N	30 55 45	LM340T-12 LM340T-15 LM340T-18	.75 .75 .75	CD4049 CD4050 CD4051	45 55 95	MM5330 P5101L	5.94 8.95	N82S126 N82S129 N82S131	5.75 4.75 4.95	6-position 7-position	.90 95	
74145N 74150N	1.20	LM340T-24 LM350	75 5.50	CD4060 CD4066	1 42	9368	3.50 10.00	N82S136 N82S137 OM8577	8.75 8.75 2.90	E-position KEYBOARDS	.95	
74151N 74154N 74157N	1.25 55	LM377 LM380N LM381	2.29 1.00 1.60	CD4068 CD4069 CD4070	39 35 35	416 TMM2016	2.50 16.95	8223 CONNECTORS	3.50	56 key ASCII ker Fully assembled Enclosure Pla		\$74.95 84.50 19.95
74161N 74162N	.70 .85	LM382 LM709H	1.60	CD4071 CD4072	30	HM6116 CLOCKS	16.50	30 pin edge 44 pin edge	2.50 2.75	Metal Enclosu		69.95
74163N 74174N 74175N	.85 .89 .85	LM723H/N LM733N LM741CH	49 85	CD4073 CD4075 CD4076	35 30 95	MM5311 4 MM5312 3	1.95	86 pm edge 100 pm edge 100 pm edge v	4.00 3.95	Red T018 Green, Yellow T0	118	.15 20
74190N 74192N	1.15	LM741N LM747H/N	35 75	CD4078 CD4081	30	MM5369	1.90 1.95 1.45	IC SOCKE	TS	Jumbo Red Green, Orange, Clipbite LED Mo	Vellow Jun	nbo 25 ns 4/80
74193N 74221N 74298N	1.25 85	LM748N LM1303N LM1304	1.75 1.10	CD4082 CD4116 CD4490	30 47 5.50		7.95 1.95 1.95	Solder Tin Low PIN 1UP PI 8 13 2	N 1UP	(spec red, amb	ec green.	yellow clear)
74365N 74366N 74367N	.65	LM1305 LM1307	1.27	CD4507 CD4508	1.95	MM5375AA/N 3 MM5375AG/N 4	3.90 4.90	14 -14 2 16 -16 2 18 -20 3	8 .40	Complete line of	breadboar	rd test equip.
74LS00 TTL	.65	LM1310 LM1458 LM1812	2.75 .55 8.25	CD4510 CD4511 CD4515	.95 .94 2.25	7207	5.50 7.50 5.95	20 29 4	.49	OK WIRE WRAP Complete line of	AP Produ	
74LS00N 74LS02N 74LS04N	25 25 25	LM1889 LM2111 LM2902	2.49 1.75 2.25	CD4516 CD4518 CD4520	1.10		4.95	PIN PI	N	2.5 MHz Freq. 0 30 MHz Freq. 0	Counter Ki	t 37.50 47.75
74LS05N 74LS08N	.25 .35	LM3900N LM3905	.59 1.25	CD4527 CD4528	1.51	6502 6502A	6.95 9.50	16 .57 21 18 .67 4	1.00 1.59	AC TRANSFORM		
74LS10N 74LS13N 74LS14N	25 45 99	MC1458V NE550N	.55 1.30	CD4553 CD4566 CD4563	3.50 2.45 2.35	6522 6530	6.95 8.75 9.50	2 level 14 pin w	w .20	6V 500 ms 6 3V CT 600 m	\$4.00 1	WALL PLUG OV 2 amp 5 2V 250 ma 2
74LS20N 74LS22N 74LS28N	.25 .25 .35	NE555V NE556A	39 65	CD4585 CD40192	95 3.00	6551 1	4.95 1.85 5.70	1 MHz 2 MHz	4.50 3.95 3.95	12V 250 ma 12 6V CT 600 m	1.95 t a 4.95 t	2V CT 250 ma 3 2V 500 ma
74LS33N	.25 55	NE565A NE566V NE567V	1.00 1.50 1.00	74C00 74C04 74C10	35	6802 1 6820	1.95	4 MHz 5 MHz 10 MHz	3.95 3.95 3.95	12.6V CT 2 amp 12.6V CT 4 amp 12.6V CT 8 amp	8,60 1 10,80 6	2V 2 amp 9. 12 VDC
74LS38N 74LS74N 74LS75N	.35 .45 .50	NE570B 78L05 78L08	4.75	74C14 74C20 74C30	75 35 35	8080A	3.50 3.95 8.50	18 MHz 20 MHz	3.90	24V CT 100 m 24V CT 600 m	a 3.95	300 ma VDC 500 ma
74L590N 74L593N	65	78M05 75108	.60 .85	74C48 74C74	1.95	Z80A Z80B 1	6.00	32 MHz 32768 Hz 1 8432 MHz	3.90 4.00 4.50	Constant Voltage 5V, 23 amp; 24V,	Transform 11 amp	ners 12V, 11 an 15
74LS95N 74LS107N 74LS112N	.85 40 45	75491CN 75492CN 75494CN	50 55 89	74076 74090 74093	1,25 1,25	Z80A P10	6.50 5.95 5.95	3.5795 MHz 2.0100 MHz	1.20			
74LS113N 74LS132N 74LS136N	45 75 49	A to D CON	VERTER	74C154 74C160	3.25	ZBO DART 1	8.65 5.25 8.75	2.097152 MHz 2.4576 MHz 3.2768 MHz	3.95 3.95 3.95	DISPLAY LEDS MAN72/74 DL704	CAVCA	.300 .75 .300 1.25
74LS151N 74LS155N	.75 79	80388 8700CJ 8701CN	4.50 13.95 22.00 13.95	74C175 74C192 74C221	1.19 1.65 1.90	Z80 DMA 1 Z80A DMA 2	7.50	5.0688 MHz 5.165 MHz	3.95 3.95 3.95	DL707/DL707R DL727/728	CAVCO	300 1.00 500 1.90
74LS157N 74LS162N 74LS163N	.75 .95 .95	8750CJ LD130 9400CJV/F	13.95 9.95 7.40	74C905 74C906 74C914	6.00 .75 1.95	ZB0A S10/0 2	3.95 8.95 5.00	5.7143 MHz 6.5536 MHz 14.31818 MHz	3.95 3.95 3.95	DL747/750 FN0359 FND500/507	CA/CC CC/CA	357 .70
74LS174N 74LS190N	1.00	ICL7103	9.50	740922 740923	5.00	Z80A S10/1 2 Z80 S10/2 2	3.90	18.432 MHz 22.1184 MHz	3.95 3.95	FND503/510 FND800/807	CG/CA	500 .90 800 2.20
74LS221N 74LS258N 74LS367N	1.19 .69	CM05 CD4000	.25	74C925 74C926 74C927	6.75 6.95 6.95	Z808 CTC 1	8.95 7.95 7.95	KEYBOARD EN	11.95	10 digit display 7520 Clairex pho Tit 311 Hex	docells	1,25 .39 9,50
LINEAR		CD4001 CD4002	35	INTERFACE ROSS	65	8212 8214	1.85	74C922 74C923	17.95 5.49 5.50	MAN4610 MAN4640 MAN4710	CA	40 1.20
	.90 1.10 1.80	CD4006 CD4007 CD4008	95 25 95	8096 8097	65 65	B224 B228	1.80 2.50 4.95	HD0165-5 D Connectors F	7.95 1\$232	MAN4740 MAN6640	00	.40 1.20 .56 .99
CA3082	1.90	CD4009 CD4010 CD4011	.45 .45 35	8098 8709 8710	1.25 1.75	8251 8253	4.75	DB25P DB25S Cover	2.95 3.50 1.25	MAN6710 MAN6740	CA	. 60 .99 . 60 .99
LM305H LM307N	.87	CD4012 CD4013	25 45	8T13 8T20 8T23	1.40 4.95 1.75	8257 8259	8.75 6.90	COMMIT	1.20	TELEVIDEO TERM Model 950	BINAL	\$980:00
LM308N LM309K	98	CD4014 CD4015 CD4016	.95 .95 .45	8124 8125	1.75	1802E plas. 1	3.95 7.95 5.95	4116 20	Ons D	ynamic RAI	W 8	\$15.40

#### ELECTRONIC SYSTEMS KITS

Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only [P/N 2) \$14.95, Kit (P/N 2A) \$51.25, Assembled (P/N 2C) \$62.95. PROTOTYPING BOARD (P/N 7907) \$21.95.

PROTOTYPING BOARD (P/N 7907) \$21.95. PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, 8d only (P/N 210) \$19.20, Kit (P/N 210A) \$119.55.

OPTO-ISOLATED INPUT BOARD 8 inputs, can be driven from TTL logic, Bd only (P/N 120) \$15.65, Kit (P/N 120A) \$69.95.

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & -12V required.Bd only (P/N 101) \$11.95, Kit (P/N 1014) \$42.89.

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) \$9.95.
RS-232/20mA INTERFACE Bidirectional, 2

passive opto-isolated circuits, Kit (P/N 7901A)

**PROM Eraser** 

Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity \$37.50 (with timer \$69.50). 6 PROM capacity OSHA/UL version \$78.50 (with timer \$108.50).

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. No PC board. \$8.95

**Z80 Microcomputer** 

16 bit 1/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board \$28.50. Full Kit \$99.00. Monitor \$20.00. Power Supply Kit \$35.00. Tiny Basic \$30.00.

Modem Kit \$60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only \$17.00. Article in June Radio Electronics.

60 Hz Crystal Time Base Kit \$4.40 Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

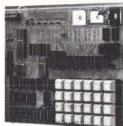
Video Modulator Kit \$9.95 Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply 8v 5 amp, ±18v .5 amp, 5v 1.5 amp, -5v .5. amp, 12v .5 amp, 12v .0 to .5 v; ±12v are regulated. Basic kit \$35.95. kit with chassis and all hardware \$51.95. Add \$5.00 shipping. Kit of hardware \$16.00. Woodgrain case \$10.00. \$1.50 shipping.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface \$359.00. Speech IC \$79.95.

1802 16K Dynamic RAM Kit \$149.00 Expandable to 64K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM \$25.00. \$-100 4-slot expansion \$9.95 Super Monitor VI.I Source Listing \$15.00



#### RCA Cosmac 1802 Super Elf Computer \$106.95

The Super Elf is a small single board computer that does many big things. It's an excellent computer for training and for learning programming with its machine language and yet it's easily expanded with additional memory, Full Basic, ASCII Keyboards, video character generation, etc.

ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Full documentation.

The Super EIf includes a ROM monitor for program loading, editing and execution with SINGLE STEP for program debugging which is not included in others at the same price. With SINGLE STEP you can see the microprocessor chip operating with the unique Quest address and data bus displays before, during and after executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 video graphics chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a speaker system included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key HEX keyboard includes 16 HEX keys plus load, reset, run, wait, input, memory protect, monitor select and single step. Large, on board displays provide output and optional high and low address. There is a 44 pin standard connector slot

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range ±17E<sup>29</sup>), 32 bit integer ±2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including renumber and essentially unlimited variables. Also, an exclusive user expandable command library.

Serial and Parallel I/O routines included
Super Basic on Cassette \$55.00.

for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for all IC's are included plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info, including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. Compare before you buy. Super Elf Kit \$106.95, High address option \$8.95, Low address option \$9.95. Custom Cabinet with drilled and labelled plexiglass front panel \$24.95. All metal Expansion Cabinet, painted and silk screened, with room for 55-100 boards and power supply \$57.00. NiCad Battery Memory Saver Kit \$8.95. All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for \$12.00 per 12 issues. Single issues \$1.50. Issues 1-12 bound \$16.50.

Moews Video Graphics \$3.50, Games and Music \$3.00, Chip 8 Interpreter \$5.50, Starship 4K cassette \$14.95. Exciting and challenging space game. Complete manual included.

### Free 14 page brochure of complete Super Elf system.

#### Super Expansion Board with Cassette Interface \$89.95

This is truly an astounding value! This board has been designed to allow you to decide how you want it optioned. The Super Expansion Board comes with 4K of low power RAM fully addressable anywhere in 64K with built-in memory protect and a cassette interface. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the Super Elf. The board includes slots for up to 6K of EPROM (2708, 2758, 2716 or TI 2716) and is fully socketed. EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor \$19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save affective to isolate pro-

gram bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include Parallel Input and Output Ports with full handshake. They allow easy connection of an ASCII keyboard to the input port. RS 232 and 20 ma Current Loop for treletype or other device are on board and if you need more memory there are two S-100 slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Thiny Basic and a video interface board. Parallel I/O Ports \$9.85, RS 232 \$4.50, TTY 20 ma I/F \$1.95, S-100 \$4.50. A 50 pln connector set with ribbon cable is available at \$18.95 for easy connection between the Super Elf and the Super Expansion Board.

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display ROM monitor., fully expandable. \$419.00. 4K Version \$449.00. 4K Assembler \$35.00. 8K Basic Interpreter \$65.00.

Special small power supply 5V 2A 24V .5A assem. in frame \$59.00. Molded plastic enclosure to fit both AIM 65 and power supply \$52.50. AIM 65 1K in cabinet with power supply \$52.50. AIM 65 1K in cabinet with power supply \$52.50. AIM 65 1K in cabinet with power supply \$52.50. AIM 65 1K in cabinet with power supply \$52.50. RAM Board Kit (16K, \$195) (32K, \$215), VD640 Video Interface Kit \$119.00. AST \$149.00. Complete AIM 65 in thin briefcase with power supply \$518.00. Special Package Price. 4K AIM, 8K Basic, power supply, cabinet \$629.00

AIM 65/KIM/SYM/Super Elf 44 pin expansion board; board with 3 connectors \$22.95.

Elf II Adapter Kit \$24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional \$18.00.



Super Color S-100 Video Kit \$129.95 Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. Dealers: Send for excellent pricing/margin program.

TERMS: \$5.00 min. order U.S. Funds. Calif. residents add 6% tax. \$10.00 min. VISA and MasterCard accepted. \$1.00 insurance optional. Shipping: Add 5%; orders under \$25.00—10%.

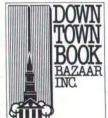
Prices subject to change

FREE: Send for your copy of our NEW 1982 QUEST CATALOG. Include 88¢ stamp.

### Save \$ on **Computer Books!**

We offer a 10% discount on computer books from Addison-Wesley, Wiley, Sybex, and Murach. Fast, reliable service and low

shipping charges for mail orders. Write for FREE catalog (or stop in to see us in lower Manhattan).



DOWNTOWN **BOOK BAZAAR.** Dept. B

172 Fulton St. (near World Trade Ctr.) New York, N.Y. 10007

Circle 144 on inquiry card.

#### - Mod II Owners Program Modifications Now A Snap With Basic IDEAS"

If you know what it's like to write programs on a mainframe computer with a well human-enginered programming facility (like SPF), then you're probably frustated with the limitations of the BASIC Line Editor of your TRS-80\* Mod II.

If you've never experienced mainframe programming power at its best, you don't know what you've been missing: Tedious line-by-line editing is now a thing of the past with Basic IDEAS and its powerful Full-Screen Text Editor:

- Changes Made Easy. Move the cursor anywhere on the screen & simply type in your
- Multi-Line Insert & Delete: Just position the cursor and insert/delete lines at will.
- Text Insert & Delete Within A Line: Again, just position the cursor anywhere on the line and insert or delete text with instantaneous within teach beat the control of the visual feedback
- visual reecoack.

  Also includes: Global Search & Replace,
  Automatic Prompting, Print, and much more.

  That's not all. Basic IDEAS\* has a full array of
  advanced programming tools that make Mod II
  BASIC Easier To Write, Easier To Read, Easier
  To Modifix.

Send for our FREE brochure for complete details and actual examples of the power of Basic IDEAS". Complete system, fully documented, only \$299. Computer IDEAS Corporation

4229 Hall St. • Dallas, Texas 75219

Circle 95 on inquiry card.

#### TRS-80® Model III 48K RAM & 2 Drives



DELIVERED

Radio Shack Warranty

HIGH TECHNOLOGY AT AFFORDABLE PRICES

(603) 673-8857 Orders Only (800) 343-0726

12 Johnson Street, Milford NH 03055-0423

#### FLOPPY DISKS

NEW Shugert SA400L	\$233.00
NEW Shugart SA450	325.00
NEW Shugart SA801R	389.00
NEW Shugart SA851R	520.00
Dual 8" enclosure, wired, power, re	ack

mount slides, remote AC power control. 849.00 

FD206 power supply.....

DISKETTES 1 year warranty, 10 per plastic library case. 8" ..single side-single density 8" ..single side-double density 28.40

8" .. double sided-double density 45.70 5%" REINFORCED HUB 10/PLASTIC LIBRARY CASE SOFT SECTORED, 10 OR 16 HOLES

single side-single density single side-double density double sided-double density

29.70 43.90

TRACTOR FEED PAPER 9% x 11 blank, 3700 sheets, perf

27.22 8% x 11 blue bar, 3700 sheets

OTHER TYPES OF MEDIA AVAILABLE . . CALL FOR PRICE METAVAN, INC.

1805 East Dyer Road, Suite 307 Santa Ana, CA 92705 [714] 540-2427

Circle 260 on inquiry card.

#### Introducing...



#### Frog Prince Software

PROGRAMMERS: We are seeking outstanding entertainment programs for publication. Unique, challenging programs for the IBM PC, the TRS-80 Color Computer and other computers with high-resolution color graphics capabilities. Write for our submissions kit.

> Frog Prince Software P.O. Box 970 **Bowling Green Station** New York, New York 10274

Circle 175 on inquiry card.

#### Beech Enterprizes 6109 South I Street Tacoma, Washington 98408 (206) 472-1094

Printers — Epson, Okidata, Nec, Anadex, Others ..... 445.00 Epson MX-80 Epson MX-100 745.00 Anadex DP9500, DP9501 ....1265.00 IDS 560 ......1104.00

Boards - Microsoft, Videx Z80 Softcard by Microsoft ....287.00 16K Ramcard by Microsoft ....146.75

Computer systems - Altos, Televideo, NEC NEC — 64K Ram, 2 Disk, 7 Expansion Slots CRT ......2379.00

Other Products & Software Available. \$

Call Hard Disk, Visicalc, Modems, Monitors, Furniture

Terms: Certified checks, personal checks, money orders. Allow 2 weeks for per-sonal checks to clear. Equipment is subject to price change and availability.

Circle 43 on inquiry card.

**Build and Enhance** your Apple \* software library at affordable prices.



For the FIRST time — PACKED disks with 60 outstanding Your Apple \* needs programs! At last you have an opportunity to use your Apple\* to its fullest capacity!

Graphics

APPLEWARE INC. offers on each disk an extensive variety of programs including:

Printer Text

Music Games Finance Utilities Data Base Engineering • and many

others with 3.3 DOS for easy demuffining.

First 3 disks available at \$59.95 each Order all 3 for a free bonus disk. Call now toll free: 1-800-327-8664 Fla. Residents: 305-584-7004 Please add \$3 for postage & handling.

6400 Hayes St.

Hollywood, FL 33024

\*TM Apple is a registered trademark of Apple Computer Co.

Circle 23 on inquiry card.

#### For CP/M-80® Users

849.95 FAST-LOCK/1 - Fast File and Disk Encryption/Decryption

- Very Fast, encrypts files or an entire disk (SS/SD 3740)
   Provides security for all but the most sensitive data \* Combination of transposition, substitution, and algebraic cyphers
   Any bit change in KEY or DATA drastically afters results
   46 bit key
- \$149.95 POWER-CRYPT/1 U.S. Government's Data Encryption
- \*\*Software implementation, that doson't require costly hardware, of the National Bureau of Standards FIPS pub. 46 (Jan. 77) Data Encryption Standard \*\* Includes FAST-LOCK1\*\* Provides high level of security for the most sensitive data \*\* Encrypts lines for entire disks with FAST-LOCK11\* \*\* Provides multiple/combination encryption \*\* "Electronic Code Book Mode" \*\* 46 bit key \*\* Combination of multiple complex permutations, product transformations, block ciphering \*\* Multiple encryptions are virtually UNBREAKABLE by ANYONE, no matter how large or sophisticated the computer/crypt oequipment.

#### SPREAD SHEET/STACK CALCULATOR \$49.95 STACK-CALC/1 - Easy to use SPREAD SHEET calculator.

Uses RPN (Reverse Polish Notation) like scientific calculators
 Symbolic names for ROW/COL's \* Three calculators;
 Accumulator, Stack, Spread sheet \* Decimal Floating Point
 112 Digits, ±98 exp.)

Send Orders, and requests for FREE information to:

#### UNIVERSAL INFORMATION SYSTEMS

26453 SKY Drive Escondido, Cal 92025

Calif. residents add 6% sales s CPIM — Reg TM of Digital Resear

Circle 422 on inquiry card.

### daisi\*typer



#### LETTER QUALITY PRINTERS

Olivetti PRAXIS Electronic Daisywheel Model 30/35 Typewriter-Printer

from \$649

non-ASCII Interface versions Buffered Centronics version Buffered RS-232 Terminals

Brand new units with 90 day warranty and case. We supply ribbons and printwheels.

Dealer Inquiry Welcom

SYSTEMED CORPORATION

P.O. Box 18, Mountain City, Tennessee 37683 Phone (615) 727-6000

Circle 400 on inquiry card.

Circle 51 on inquiry card.

### INCREDIBLE? BELIEVE IT!

### **Washington Computer Services**

an affiliate of ((( WASHINGTON )))

CUSTOM COMPUTER ROOM WIRING SINCE 1960

97 Spring Street, New York, New York 10012

TO ORDER: CALL OUR TOLL-FREE NUMBER: (800) 221-5416 In N.Y. State and for technical information: (212) 226-2121

HOURS: 9 AM-5:30 PM (EST) Monday-Friday

TELEX: 12-5606

CABLE: WASHCOMP NYK

#### PRINTERS



150 cps bidirectional - 9x9 dot matrix, quietized case, 136 col, vertical form control and many other functions NOW \$950 The best price/performance ratio available

RS-232 serial to 19,200 baud x-on, x-off add \$25

Teletype 40, 300 LPM-typewriter quality, RSfrom Only 232 interface. This quality printer is available in many \$3200

configurations including forms access, quietized case, etc. Teletype 43 from \$995 Teletype AP-200, 340 cps dot matrix (similar to Data Prod. M-200) \$2799 NEC Spinwriter-55 cps, bidirectional, letter quality \$2560 KSR 7720 \$2799 DIABLO 630-40 cps, bidirectional, daisy wheel, plot/graph \$2349 QUME Sprint 9/35 cps, daisy wheel \$1944 C. ITOH Starwriter, 40 cps, daisy wheel, F10 \$1550

EPSON MX-80, 100, 80 cps, 9x9 dot matrix SCALL ANADEX 9500/9501, up to 200 cps, high resolution dot \$1325 OKIDATA Microline 82A, bidirectional, friction / pin feed \$525 Microline 83A, bidirectional, 120 cps, uses 15" paper \$799 TI-810, 150 cps, Basic \$1449 Package-Compressed print, vertical form control \$1630

MANNESMANN MT 1705 200 cps, 7x9, 132 col SCALL TALLY MT 1805 200 cps, 7x9 + NLQ 40x18 matrix **SCALL** CENTRONICS **\$CALL** 739 100 cps, nx9 dot matrix, Full Graphics \$567

\$899 122 120 cps, International set, Full Graphics DEC LA-34 \$1085 IDS PRISM, 132 col., color \$1785 TERMINALS PMMI MODEM

\$359 AMPEX DIALOGUE 30, 80, 81 SCALL TELEVIDEO 910 C (multi-terminal) \$610 925C \$795 950C \$950 SOROC IQ 120 \$729 HAZELTINE ESPRIT \$669

WYSE WY-100 (ALTOS 1) **NEW! SCALL** Similar savings for our HAZELTINE and LEAR SIEGLER lines

**DEC VT-100** 

SOLLMWE			
MBASIC-80	\$275	WORDSTAR	\$300
MBASIC COMPILER	\$285	MAILMERGE	\$110
FORTRAN-80	\$349	DATASTAR	\$230
COBOL-80	\$574	DBASEII	\$525
PL/1-80	\$425	CONDOR III	\$716
PASCAL MT + V5.5	\$398	MILESTONE	\$235
WHITESMITH'S C	\$660	SUPERCALC	\$221
BSTAM, BSTMS	\$200	FMS-80	\$649
CB-80	\$420	SELECTOR V	\$396
PEARL (LEVEL 3)	\$549	SPELLGUARD	\$236
LIFEBOAT SOFTWARE	\$CALL	SUPERSOFT	SCALL
PEACHTREE	\$CALL	AMERICAN BUS. SYST	.SCALL
GRAHAM-DORIAN	\$CALL	ACCOUNTING PLUS	SCALL
STRUCTURED SYST.	SCALL	TURBODOS (MULTI)	\$500
VANDATAIDEDODNE	\$500	THRRODOS (1 HSER)	\$220

#### 8" DISK DRIVE SALE

8"SHUGART SA801R \$450 8"SHUGART SA 851R \$669 2 for \$1289 **QUME DATATRACK 8** 2 for \$1110 Enclosure, power supply for 28" drives A&T \$350 MORROW DISCUS 2D + CP/M®, MICROSOFT BASIC, CONT. \$950

#### HARD DISK SPECIALS

CORVUS 5MB, 10MB, 20MB Constellation Multiplexer and Mirror Backup MORROW 26MB + controller + CP/M 2.2®, M basic controller, CDC Hawk Drive (5 fix, 5 rem) \$7995 \$6795 controller, Western Dynex (5 fix, 5 rem) \$5099 \$5995

Winchester 51/4 drives complete with case, cable, software, S-100 controller. Adapter avail. for use with XCOMPany Z-80 system. Cartridge drive controllers avail

NIP		ally 2 00 3y	Hom. Darting	go univo	Controllers avai	4
5MB	APPLE S-100				Z-89	\$2898
10MB	XEROX ALTOS	OEM	discounts ava	ailable!	R.S. MOD. II	\$3398
ADE	5 & <b>KO</b>	MAN"	5 ¼ ", 8" and	14" Wi	nchester/tape subsystems ava	il.

#### **FULLY CONFIGURED BUSINESS SYSTEMS**

The following are some examples of the fully assembled and tested business and scientific computer systems which we offer.

8000 SX, multi-user, multi-processor, turbo DOS SCALL CPM 2.2. FULL 2 YEAR WARRANTY! 68000 16 bit multi-user UNIX V.7 **SCALL** SEATTHUTTER 8086 16 bit, 128K RAM, Syst. #2 \$3499

Call us for best prices on these high quality 2nd

Systems Group generation boards and systems.

These high quality, reliable products have made CCS California Computer defacto industry standard for S-100 products Systems Assembled and tested: \$316

2810AZ-80 CPU, serial port 2200 H.D. Mainframe \$517 2065C64K dynamic RAM \$409 2422A Floppy Cont, CP/M 2.2 \$427 CCS 2210A w/floppy controller, 1 serial port \$2116 CCS 300-1A w/1.2 MB floppy drives, 2 serial, 2 parallel ports **SCALL** 

**DIGIAC** Fine Computers SCALL ODBOUT We offer generous discounts of the fast, quality 8 and 16 bit boards We offer generous discounts on the Compupro line of

**ADVANTAGE** \$CALL **NorthStar** & HORIZON NECLow prices on PC-8000 series **SCALL** DELTA S-4500 10 User, Multi-Processor, 40 MB hard 17 MB tape \$CALL ALTOS single and multi-user systems SCALL SCALL MORROW Decision 1, CP/M Microsoft Basic, UNIX

XEROX. 820 Desktop computer-64K, 2 floppys. (CP/M avail.) \$CALL

Similar savings on the full lines of CCS, SSM, NNC, MORROW, DELTA, NORTHSTAR, ITHACA INTERSYSTEMS, GODBOUT, NEC, TELEVIDEO, IMS ZENITH, ADDS, DEC, DATA GEN., ATARI, DYNABYTE, TECMAR, DUAL

#### LOOK HERE!

Call us for ALL your softwear needs

AMPEX Dialogue 80' Systems Houses, Educational Institutions, & Government Agencies Given Special Consideration

ALL OF OUR PERIPHERALS CAN BE CONFIGURED FOR RADIO SHACK® MODEL II

\$1575

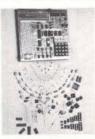
### DEALER and INTERNATIONAL INQUIRIES WEL

For fast delivery, send certified check, money order or call to arrange direct bank wire transfer. Personal or company checks require two to three weeks to clear, All prices are mail order only. Prices subject to change without notice; call for latest prices. Prices include 3% cash discount. N.Y. residents add sales tax. Qantex is a trademark of North Atlantic Industries, Inc. Radio Shack® is a trademark of the Tandy Corp. CP/M® is a trademark of Digital Research. All sales subject to our standard sale conditions (available on request).



517

### KIT-80 INC.



#### E-Z-80 ENTRY

A Z-80 Micro Computer with CPU: CTC: PIO: Prom Programmer: Read Outs: Key Pad: Onboard ROM & RAM: Wire Wrap: DC Regulator: Manual & Instructions.

Kit Price 390

18601 LBJ Fwy . Mesquite, Texas 75150 · 800-527-1593

Circle 231 on inquiry card.

### PRICE BREAK

\$107.46 per dozen Minimum Order 3 Ribbons **Price Includes Shipping** We accept Mastercard and Visa

CHECK-MATE P.O. BOX 103, RANDOLPH, MA 02368 Call Toll Free - 1-800-343-7706 In Massachusetts - 617-963-7694

Circle 72 on inquiry card.

### EPSON

DOT MATRIX PRINTERS SUPER DISCOUNTS ON MX-80F/T NOW

MX-80 MX-100

IN STOCK

We also stock direct connect cables for TRS-80, Apple, IBM, Atari, Pet or RS 232

TO ORDER (209) 667-2888 or 634-8888



### **RIBBONS** at

Multistrike ribbons (black) for:

	New Ribbons	Reloaded Cartridges	Refill* Ribbon Pancakes
Qume (Ours)	\$3 ea.	\$2 ea.	\$1 ea.
Diablo (Univ.)	\$4 ea.	\$3 ea.	\$2 ea.
NEC (Orig.)	\$4 ea.	\$3 ea.	\$2 ea.
Wang (Ours)	\$4 ea.	\$3 ea.	\$2 ea.
Ricoh (Orig.)	\$6 ea.	\$4 ea.	\$3 ea.
(Cloth ribbon	s will he	available s	hortly)

\*Minimum order 3 pancakes with instructions. Add 25 percent for orders of less than 1 doz. We "trade" for RELOADABLE used cartridges. Write for price lists on diskettes, printwheels and other ribbons. Order our new 150 page book HOW TO RELOAD MULTI-STRIKE DAISY WHEEL WORD PROCESSING RIBBONS. \$49. This book puts you in business reloading ribbons at home.

WILLIAM WALKER

Word Processing Supplies 306 West 46th St. New York, NY 10036

Circle 431 on inquiry card.

#### **VOLTAGE SURGE &** TRANSIENT SUPPRESSOR



Protects Most Electronic Equipment

The SUPPRESSOR electronically removes or reduces sudden voltage changes. It simply plugs into a power receptacle on the same circuit as the equipment being protected.

END POWER LINE SPIKES, SURGES, HASH... Only \$29.95 ea. Dealer Inquiries Invited.



CUESTA SYSTEMS, INC.

3440 Roberto Court San Luis Obispo, California 93401 (805) 541-4160

Circle 128 on inquiry card.

### ADDS VIEWPOINT

\$495 Qtv. 1

Modem 300/1200 \$699

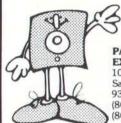
### DEC COMPATIBLE

Datamedia Excel 12 \$1,295 Excel 22 \$995

Economy Peripherals (404) 952-0213

### Verbatim flexible disks

Call Free (800) 235-4137 for prices and information. Dealer inquiries invited. C.O.D. and charge cards accepted.



VISA'

PACIFIC **EXCHANGES** 

100 Foothill Blvd. San Luis Obispo, CA 93401. In Cal. call (800) 592-5935 or (805) 543-1037.

Circle 320 on inquiry card.

### 6400

### AL

One Year Full Warranty Delivery from stock





305-776-7177

Circle 384 on inquiry card.

### SUPER SALE

#### **EPROM**

50 up 1-7 8 up CALL 2716 4.15 3.90 2732 9.70 8.85 CALL

#### **16K RAM EXPANSION KIT** For TRS-80 Model III

Set of 8 pieces UPD416-2 (200nS) Data furnished with purchase on request. \$13.95

WRITE FOR FREE CATALOG



### SUNTRONICS CO., INC.

12621 CRENSHAW BOULEVARD HAWTHORNE, CALIFORNIA 90250

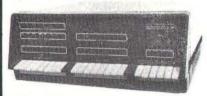
OUTSIDE CALIFORNIA TOLL FREE (213) 644-1149 1-800-421-5775

-Minimum Order: \$10. Send Money Order or Check to Mail Order—Minimum Order: 910, Send Money Order of Charles A.
P.O. BOX 1957—Dept. B HAWTHORNE, CA 90250, User your VISA or Mastercard (please include expiration date). Add \$2.00 postage and handling to order. California residents add 6% sales tax.

# Best prices We beat

### **COMPUTERS**

**INTERSYSTEMS** 



DPS1 DPS1A DPS2A CALL FOR PRICES

DYNABYTE List. Less 30% ALTOS List ..... Less 20% NORTHSTAR

Horizons & Advantages ..... CALL

TELEVIDEO COMPUTER SYSTEMS ..... CALL

#### **SUPERBRAIN**



64K	DD.										÷						\$2639
64K	QD.																\$2949
DSS	5-101	ME	G	H	a	rc	11	Di	s	k				-			\$3195

#### **CROMEMCO**

CS-1 List, \$39	95	OUR	PRICE	\$3195
CS-2 List, \$46	95	OUR	PRICE	\$3549
CS-3 List, \$79	95	OUR	PRICE	\$6349
72H List \$900	05	OLID	DDICE	\$700E



data systems



Z-89 List OUR PRICE \$2099

### **TERMINALS**

TeleVideo



Televideo	910C	CALL
	912C	
	920C	CALL
	925C	CALL
	950C,	CALL
INTERTU	3E	\$725
Emulator.		. \$725
OKIDAT	A	
Microline	30	\$359
Microine	32A	\$469
Microine	33A	\$749
с.тон	CALL FOR F	RICES

#### SOROC

Soroc IQ120			ŭ.	+						,						\$679
IQ130						,	,									\$585
IQ135			+	+	+											\$719
4Q135 w	t	11	d	n	11	 ,										\$789
IQ140	, T				+			•	,	,		,		(4		\$995

#### **HAZELTINE**

1420.											14-				:		CALL
1500.					6			40		÷		¥			4		SAVE
																	CALL

### **ZENITH** Z19......\$639

Prices are for pre-paid orders only, and reflect a cash discount. C.O.D.'s and charge cards slightly

Most items in stock for immediate delivery factory sealed outbus wifull factory warranty NYS residents add appropriate sales tax. Prices do not include shipping © 0.0 orders require 25% deposit. Prices subject to change without notice.

### PRINTERS CENTRONICS



749-1 PAR	\$699
739-3 SER	\$619
704-11 parallel	\$1569
704-9 (RS232)	\$1519

TI 810	
810 Basic. 810 Full Option. 820 RO Basic. 820 KSR Basic.	\$1599 \$1545
NEC 7710 (RS232) SERIAL 7730 PARALLEL	
Qume	CALL FOR PRICE
<b>Diablo 630 RO.</b>	\$3495
460G	\$799 \$839 \$1099
132 w/color	
Epson MX 80	\$465
MX 100	\$548 \$745

### DISK SYSTEMS

#### MORROW

Discus 2D		\$835
Dual Discu	ss 2D	\$1385
Discuss 2 +		\$1199
M 5 5meg	g Hard Disk	\$1995
M 10 10 r	neg Hard Disk	\$2995
M26 26 m	neg Hard Disk	\$3349
CORVUS	5 meg Hard Disk	\$2999
CORVUS	10 meg Hard Disk	\$4279
CORVUS	20 meg Hard Disk	\$5159

Prices subject to change without notice



6MHz CPU Z, 64K,, (2) 8" DRS SYSTEM 6MHz CPU 85/88, 64K, (2) 8" DRS, SYSTEM 2795, 8MHz CPU 8086, 64K, (2) 8" DRS. SYSTEM 2995. INCLUDES INTEGRAND CAB 10 SLOT & CPM tm 80 or 86 CPM &MPM ARE TRADEMARKS OF DIGITAL RESEARCH LOMAS DATA PRODUCTS

10MHz 8086, 128K, (2) 8" DRS SYSTEM \$2995. MPM<sup>tm</sup>86 8086, FLOPPY SYSTEM 128K 3495 (FOR SB86 FOR CODBOUT DUAL PROCESSOR C

SYSTEM I 64K \$2549, SYSTEM II 128K \$3325, (2) 8" 801's IN MORROW CABINET W/PS 1056.

MORROW DESIGNS

DECISION 1 w/DUAL 5%" DRS., 65K, CPM, WIN A GOIBOUT DUAL PROCESSOR 85/88 WRITE ALL GODBOUT, LOMAS, OR SEATTLE SYSTEMS AVAIL-ABLE IN BUDGET SYSTEMS ABOVE OR LUXURY SYSTEM ABLE IN BUDGET SYSTEMS ABOVE OR LUXURY SYSTEM
WITH CONSTANT VOLTAGE TRANSFORMER ON MAINFRAME
AND DRIVE CABINET STARTING AT \$3595
ALL PRICES SUBJECT TO CHANGE
PD 951 JESTIMINSTER CR 92593-0951
7/4 895-17-46

Circle 381 on inquiry card.

Quality cables with immediate delivery and low prices.

Conductor	Price
1-4	\$11.50 + .15/ft.
5-7	12.00 + .25/ft.
8-12	13.00 + .30/ft.
13-16	14.00 + .40/ft.
17-25	16.00 + .50/ft.

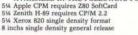
Specify: Male or female connectors, length of cable and pins to be connected. OEM & quantity discounts available to qualified customers. On prepaid orders add \$4.50 for shipping/handling.

We also supply DEC and IBM Compatible cables.

### Communication Cable Company

319 Louella Ave. Wayne, PA 19087 215-964-9404

Circle 83 on inquiry card.



MAGIC

Telecommunication Software

1. MAGIC is compatible with any Host Computer Full or Half Duplex.

2. Use your CP/M computer system as an intelligent ter-

minal on your modem.
3. Send disk files of text, programs, or keyboard input to

host computer.

Record in a disk file all or part of the conversation with

the host.

5. Send and Record disk files on your CP/M system without logging off of the host system.

6. Modular software is easily configured for various types of terminals computers, and modems.

HARDWARE REQUIREMENTS

 CP/M computer with 32K memory min.
 Integral modem or RS-232 port and stand alone modem. AVAILABLE IN THE FOLLOWING FORMATS

MAGIC \$95.00 Users Manual only \$10.00 Terms certified check or money orde Allow two weeks for personal check Nebraska resident add 3% sales tax

TEL

7016 N 107 CT Phone 402-493-9580

Engineering Labs

Omaha Nebraska 68142

Technical

Circle 407 on inquiry card.

### aba

When it comes to Flexible Disks, nobody does it better than Wabash.

MasterCard, Visa Accepted. Call Free: (800) 235-4137



Circle 320 on inquiry card.

## Hey

New and Defurbished Equipment

Mem and Heldibished Equi	hmem
8" Disc Drives	\$400.00
Letter Quality Printers  Qume & Diablo	\$1600.
Oscilloscopes Dual Trace, 15Mhz.	\$900.00
Computer Systems, CP/M with 2 8" disc drives, CRT 64K, letter quality printer	\$7500.

All Sales Final Ontario Residents add PST All iten ms warranty 90 days, parts & labour All prices in Canadian Funds

154 Fulton Ave. Toronto, Ontario M4K 1Y3

#### TSA PROFORMA INC.

(416) 922-1139 425-9058

Circle 463 on inquiry card.

- Change printers without unplugging cables.
- Centronics compatible I/O parallel model.
- RS 232C serial model.
- All solid state electronics
- Attractive styling, compact size

only \$129.95



Switch box runs

2 printers from

one CPU port.



automated control systems, inc.

COMPUTER

**CLASSIFIEDS™** 

Buy - Sell - Employment - Etc.

National on-line classified system for all

Sell your unneeded equipment, or up-

There is no charge to read the listings.

Club listings, reader to reader messages,

and letters to the editor may be placed at

no charge. Ads are \$10.00 for 90 days,

payable by Visa, MasterCard or check. Ads are up to 1200 characters long. Ads

may also be sent in written form to the

address below. Ads are not limited to

computer related subjects. No delay,

your ad is working for you the minute you

14218 N.E. 21st St., Bellevue, WA 98007 Or call Tracy Martin at (206) 881-0177.

Circle 34 on inquiry card.

types of advertisements.

grade with good used gear.

#### MEMORY EXPANSION

FOR APPLE® The company that brought you the first 32K RAM board for Apple II® and Apple II+® now offers:

- 128K RAM ALL FOR ONLY \$599
- Includes 1. MOVEDOS (relocates DOS) 5 2. RAMEXPAND (for Applesoft®, integer®) comprehensive 3. PSEUDO-DISK for DOS 3.3 or 3.2 4. PSEUDO-DISK for CPM\*
- 5. PSEUDO-DISK for PASCAL

#### ● 64K RAM \$425

um range memory expansion board which can be upgraded to 128K at a later date. (Upgrade kit sold for \$175) Includes all 5 software packages offered with the 128K board.

### • 32K RAM STILL ONLY \$239 The old favorite for Apple users. Includes our first 3 software packages (above) with CP/M® and PASCAL pseudo-disks now offered as options (\$39 each).

VC-EXPANDTM MEMORY EXPANSION ONLY \$100

#### FOR VisiCalc

Expand memory available to Personal Software's 16 sector VisiCalc®. Add 32K, 64K, or even 128K to To sector VisiCator. Add 32K, 64K, or even 128K to your present workspace (even if you already have a 16K card in usel) with this program plus one or more \$\int\_{\text{SYSTEMS}}\$
Saturn boards.

Simple operation.

313/973-8422 program plus one or more

## YOU'VE JUST Computer Shopper is your link to indivi-

duals who buy, sell and trade computer equipment and software among themselves nationwide. No other magazine fills this void in the marketplace chain.

Thousands of cost-conscious computer enthusiasts use Computer Shopper every month through hundreds of classified ads. And new equipment advertisers offer some of the lowest prices in the nation.

Subscribe to Computer Shopper with a 6 month trial for only \$6. MasterCard or VISA call TOLL FREE 800-327-9920

COMPUTER SHOPPER P.O. Box F307 • Titusville, FL 32780

305-269-3211

enter it!!!

512 346-4495 @ 300 baud 24 hours, multiple lines

#### **COMPUTER CLASSIFIEDS**

8348 Summerwood Austin, Tx 78759

Circle 368 on inquiry card.

Circle 101 on inquiry card.

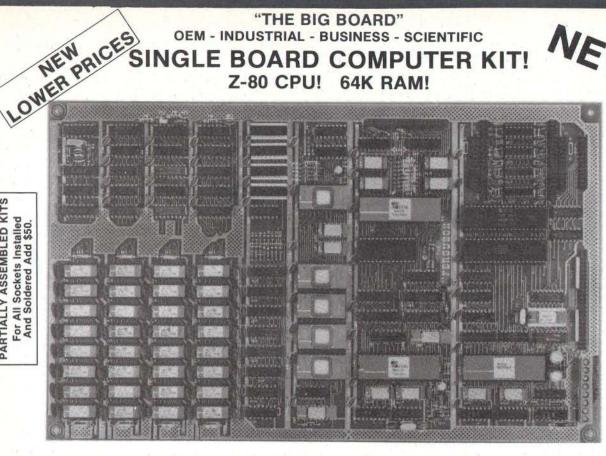
"THE BIG BOARD"

**OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC** 

#### SINGLE BOARD COMPUTER KIT! Z-80 CPU! 64K RAM!



PARTIALLY ASSEMBLED KITS For All Sockets Installed And Soldered Add \$50.



Documentation and WANT MORE INFO? Schematics In:

THE BIG BOARD PROJECT: Three years in the works, and maybe too good to be true. A tribute to hard headed, no compromise, high performance, American engineering! The Big Board gives you all the most needed computing features on one board at a very reasonable cost. The Big Board was designed from scratch to run the latest version of CP/M\*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed! Take a Big Board, add a couple of 8 inch disc drives, power supply, an enclosure, C.R.T., and you have a total Business System for about 1/3 the cost you might expect to pay.

FEATURES: (Remember, all this on one board!)

(64K KIT BASIC I/O)

SAME AS AN 8 IN. DRIVE. REQUIRES: +5V @ 3 AMPS - 12V @ .5 AMPS.

#### 64K RAM

**FULLY SOCKETED!** 

Uses industry standard 4116 RAM'S. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

#### **Z-80 CPU**

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

#### SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator, FULL RS232! For synchronous or asynchronous communication, In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: \$65.

#### BASIC I/O

Consists of a separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

#### BLANK PC BOARD — \$175

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

#### 24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case

#### FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M\* 2.2.

#### TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. User selectable hand shake polarity. Set of all parts and connectors for parallel I/O: \$19.95

#### REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all

#### CP/M\* 2.2 FOR BIG BOARD

The popular CP/M\* D.O.S. to run on Big Board is available for \$159.00.

### PRICE CUT

#### PFM 3.3 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, Boot CP/M\*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search. PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

### Digital Research Computers

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Shipments will be made approximately 3 to 6 weeks after we receive your order, VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a \$75 deposit. Balance UPS COD. Add \$4.00 shipping.

USA AND CANADA ONLY

#### IRM PC TRS-80 \* MODEL II

#### ADVANCED PRODUCTIVITY SYSTEM

APS is a productivity booster that can be compared with IBM's SPF system. The sophisticated user will settle for nothing less. Note these features:

- Menu driven, user friendly general purpose architecture
- Dual screen operation
- Primary, Line and Function key commands
- Separate Edit and Browse subsystems Dynamically adjustable scrolling in all four directions
- External datasets merge and create Text formatter, similar to IBM's SCRIPT/GML formatter, is designed for
- large documents Built-in utilities allow dataset format conversions

All registered users of our products receive full maintenance support. For more information

ARRIX LOGIC SYSTEMS INC. P.O. BOX 142 DON MILLS, ONTARIO

CANADA M3C 2R6

\* Registered Trademark of Tandy Corporation

Circle 27 on inquiry card.

#### **FORECASTING**

EASI/ARIMA - The first and only microcomputer program to develop and run ARIMA (Box-Jenkins) models...all automatically. De signed for the stock or commodity trader. Create a database or read Compu Trac files directly. Requires no knowledge of statistics. Recommended by Chase Econometrics. \$300.

TWG/ARIMA - The statistician's version of EASI/ARIMA. Complete control and more options, such as seasional models and Box-Cox transformations. \$300.

ELF is our general purpose statistical package. \$200.

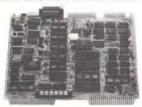
All are for the Apple II\* with 48K of memory, Applesoft\* and DOS 3.3. Visa and MasterCard accepted. Call or write:

> The Winchendon Group 3907 Lakota Road P.O. Box 10114 Alexandria, VA 22310 (703) 960-2587

\*Trademarks of Apple Computer, Inc.

Circle 436 on inquiry card.

#### MULTI-FUNCTION MICROCOMPUTER



FLEXI PLUS is a 6809 E microprocessor with builtin controllers for:

- -8" and 5%" IBM compatible Floppy Diskettes -IEEE-488 Instrumentation Bus
- RS-232/20MA Communication at 50-19.2K Baud Parallel/Serial I/O and Cassettes Up to 56K on board RAM, ROM, EPROM
- Advanced Debugging Monitors

The most complete single board microcomputer. Special price: only \$695 with all options and 2K RAM/2K EPROM.

Quantity discounts available. See us at Comdex/Spring '82, June 28-30, booth #1369.

The Computerist, Inc.

34 Chelmsford St. Chelmsford, MA 01824 617/256-3649

Cash in on your creative energies, Soft Computer Systems' SOFTWARE DEVELOPMENT PROGRAM. Get all of your R&D hardware at our distributior cost plus

### 20% Royalty!

We give you personalized service, offer a nonexclusive marketing agreement, plus other specialized services. We seek: high level language compilers, cross-assemblers, utili-ties, DMBS, new OS, educ. and business ap-plications, and any other marketable program. We offer full development and documentation. Don't hesitate, contact us immediately.

> Michael L. Dean, V.P. R&D InfoSoft Computer Systems

2699 Clayton Rd. Concord, CA 94519



(415) 680-0202

Single Source Solution

Circle 203 on inquiry card



TRS-80\* - APPLE - COMMODORE-ATARI



Quality Computer tape recorder at peak pr CERTIFIED AT 1600 FCI ONE YEAR WARRANTY SPECIAL INTRODUCTORY OFFER

SPECIAL INTRODUCTORT OFFER!				
MICRO-COMP MODEL	UNIT PRICE	10 PACI		
C-10 (50 feet)	\$2.95	\$20.00		
C-20 (TRS-80*) (100 feet)	3.15	22.00 □		
C-30 (150 feet)	3.35	24.00 □		
C-60 (300 feet)	3.55	26.00 □		
Head Cleaner	2.95 □	20.00 □		

TRS-80-trademark of the Tandy Corp.

CHECK MASTER CHARGE T VISA Minimum order for credit cards \$10.00 Card Account No. \_\_\_ Expiration Date

Name Address City State

Mail to P.O. Box 806, Shelton, CT 06484

Circle 247 on inquiry card.

_	800 (16K)	649
249	400 (16 K)	319
	410 Recorder	74
₩.	810 Disk Drive	439
_	822 Printer (THERMAL)	269
20	825 Printer (80 COLUMN)	589
	830 Modem	149
$\underline{\circ}$	850 Interface	164
>	853 Memory(16K)	79

			110111		
911105	ATARI SOFTWARE				
4002	BASIC CARTRIDGE	45	483 THE PROGRAMMER 52		
4003	ASSEMBLER EDIT	4.5	484 THE COMMUNICATOR 299		
4006	SUPER BREAKOUT	33	404 WORD PROCESSOR 110		
4007	MUSIC COMPOSER	45	405 PILOT (EDUC) 99		
4008	SPACE INVADERS	33	4106 PROGRAMMING 2 21		
4009	COMPUTER CHESS	33	4117 PROGRAMMING 3 21		
4011	STAR RAIDERS	37	8126 MICROSOFT BASIC 68		
4012	MISSILE COMMAND	33	8121 MACRO ASSEM&EDIT 66		
4013	ASTEROIDS	33	BI3 CAVERNS OF MARS 29		

CALL OR WRITE FOR FREE CATALOG COSMIC COMPUTERS

228 N. PROSPECTORS RD. DIAMOND BAR, CA. 91765 SHIPPING EXTRA \$2 MINIMUM PRICES SUBJECT TO CHANGE CALIF RESIDENTS ADD TAX

(714) 861-1265

### E-PROM! RAMS 2114L-200NS LEDS Jumbo Red .10ea. Min. 10pcs. Jumbo Yellow .10ea. Min. 10pcs. SOCKETS DIP SWITCHES 8 Pin Tin L.P. 14 Pin Tin L.P. 16 Pin Tin L.P. 4" Muffin Fans All merchandise is 100% Guaranteed, IT not completely satisfied return for a full cash TERMS: COD, WISA, or MASTERCHARGE accepted Allow 2 weeks for personal checks to clear. SHIPTING: 2.50 UPS ground Min. Order \$10.00 3.50 UPS HIJE Call the kerty Electronic Super-Mart Inc. 887 Bay Road Hamilton, Mass. 01936 (617) 488-3046

Circle 202 on inquiry card.

### Volrax SC-01A SPEECH SYNTHESIZER



\$70 Each (5 or more.

#### Order in Ones or Thousands

The SC-01A Speech Synthesizer is a completely selfcontained solid state device. This single chip phonetically synthesizes continuous speech of unlimited vocabulary.

The SC-01A contains 64 different phonemes which are accessed by a 6-bit code. Computer interfaces and text-to-speech algorithms also available for product development.

Votrax is a trademark of Federal Screw Works

Call 1-800-645-3479, in N.Y. 1-516-374-6793

MICROMINT INC. 917 Midway Woodmere, N.Y. 11598









Circle 464 on inquiry card.

Bill Cosby

When you learn CPR youre ready to



American Red Cross

## CALIFORNIA DIGITAL

Post Office Box 3097 B • Torrance, California 90503

NEW!
Ampex
D81 Terminal
Only \$895

AMPEX

AMPEX

## D81 buffered editing terminal with detached Selectric-style keyboard.

Operates in conversational or block mode at synchronous rates to 19.2Kbps. RS232C interface. Operates in either full or half duplex. Parallel printer interface is standard. The D81 offers ergonomic design, sculptured profile and award-winning styling plus these features:

- Familiar Selectric-style detached keyboard
- Amber, green or white phosphors
   Non-glare
   12" display formatted as 24 lines by 80 columns of data with 25th status line
   Standard memory two 1920 character pages with third and fourth pages optional
   Standard editing functions include erase, insert and delete character and line operations
   Full range of visual attributes
- Half-intensity protected fields 128 displayable symbols, including 96 ASCII characters, 21 control characters and 11 line drawing characters
   Twenty function keys with 10-key numeric pad. Function keys supported by standard 256KB memory expandable to 2MB Function key

#### Also from Ampex!

memory down-loadable from host.

**D80 Terminal.** Similar features to D81 but with detached programmer-type keyboard. **D30 Terminal.** Strictly inter-active terminal. Detached keyboard. Operates in on-line, local or monitor modes. Economy and ease of operation make it ideal for basic data communications.



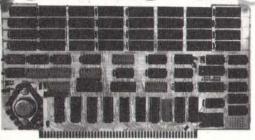
All merchandise sold by California Digital is premium grade.
Shipping: First five pounds \$2.00; each additional add \$.40
Foreign orders 10% shipping. Excess will be refunded.
California residents add 6% sales tax. COD's discouraged.
Open accounts extended to state supported educational institu-

TOLL FREE ORDER LINE (800) 421-5041
TECHNICAL & CALIFORNIA

## CALIFORNIA

Post Office Box 3097 B • Torrance, California 90503

**California Digital** 



RELIABILITY OF STATIC ... PRICE OF DYNAMIC

Sixteen Bit Memory

550

February Price 5850 30% Price Reduction

Utilizing the new Hitachi 5167/2167 ram chip, the Static 54 is the most current technology available is S-100 memory products.

24 bit extended addressing, 8 or 15 bit data paths along with 16 bit request and acknowledge make this unique board completely compatable with the IEEE 568 5-300 buss standard.

with the IEEE 698 S-100 busines standard.

The Static 64 has been engineer at a callow each 16K segment of memory to be bank selectable supporting multiuser systems. Other selectable supporting multiuser systems. Other selectable features allow the board to fully integrate with all current bank selecting schemes including Cornex and Alpha-Micro. Operates with all 16 bit computers including Seattle Computers. Tecmar and Lomas. Designed for DMA operations at clock frequencies in excess of 10 MHz. Standby power consumption less than one Amp.

To add to the total integrity of the product, each board is subjected to extensive high temperature burn-in and test procedures. CAL-5400

## 1

### GREEN PHOSPHOR MONITOR

The new Zenith ZVM-121 monitor features a P-31 green phosphor tube along with 15 MHz bandwidth.

Switch selectable for 40 and 80 character per line screen formats.

Accepts composite video and is fully compatable with 80 column Apple cards.

VDM-121 20 lbs.



**EPSON MX80** \$450

Epron MX199 132 column
Grafitax 80 option 70.00
Applr I/O & cable (B131) 129.00
Serial interface (B141) 145.00
Serial inter, 2K but, (8151) 145.00
LEEE 488 interface (B101) 65.00
Heplacement heaf 45.00
Heplacement Huben 144.00
Paper 3300 abests 9 1/2" 35.00

NEC PC-8023A

\$535





ADDS Regent 25 numeric cluster

ADDS Regent 30 25th status line ADDS Regent 40 limited graphics ADDS Regent 60 Block mode

ADDS Regent 60 Block mode Ampex Dialouge 80 two page, detatch Digital Equipment VT-132 IBM 3101-10 character mode green IBM 3101-20 block mode

Televideo 920C Televideo 950C detatchable keybd. Zenith Z-19

ADDS Viewpoint

Visual 200

Televideo 910C (new) Televideo 912C

**AMPEX DIALOGUE 80** REDUCED PRICE

VDT-RVP

850

1495

1895

1195

995

665

745

VDT-R25

VDT-R30

VDT-R40 VDT-R60

VDT-D80 VDT-V100

VDT-V132

VDT-3101 VDT-31012

VDT-V200 VDT-T910

VDT-T912

VDT-T920

VDT-Z-19

pages (four optional) dual program keys, half intensity prote line. Transmits data either block, line or character mode VIIT-D80 shipping 47 lbs.

### PRINTRONIX

P-300 \$4500 P-600 §6150

### INTERS

Anadex 9500 Anadex 9501 Anacom 150	PREMX100 PRA9500 PRA9501 PRA150	\$475 595 1295 1295 1075 1095 1350 2150 2850 2496 1350 4500 6150	NEC/Sm 16K TEC/Starwrit. Okidata 80 Okidata 82 Okidata 83 Teletype 43K Texas Ins. 810 Tex. Ins. 810C Centronics 730 Centronics 730	PRC737P PRC739P PRC704-9	2695 2795 1395 419 619 895 1450 1795 529 695 795

### SYSTEMS



apple **48K Memory** 



### VIDEO MONITORS



BMC KG-12C 20 MHz P31 green phosphor \$169 NEC gm. 1201 \_\_\_\_\_ \_\_ 189 Zenith gm ZVM121 \_\_\_ 119 BMC color composit \_ 339 \_ 395 Zenith color 13" NEC RGB 1202DH \_ \_\_ 895

**EPROM ERASER Ultra Vilot Products** 

UVP-11E



### ACCESSORIES FOR THE COMPUT

CALIFORNIA COMPUTER SYSTEMS
Arithmetic Processor 7811 B/C \$1919
Asynchronous serial interface 7710 129
Centronics Interface and 7728 05
LSK PROM Module 7114 05
LSK PROM Module 7144 99
Parallel interface 7720A 99
Programable Timer 7740A 99
Analog/Digital converter 7470A 99 MICROSOFT PRODUCTS 379 C. HAYES PRODUCTS Micromotem for Apple COMPUTER STOP PRODUCTS Couble Vision / 80 Column Vide

MOUNTAIN COMPTTE PRODUCT
https://doi.org/10.1009/10.10 319 250

S-100 BOARDS Assembled . Tested . Burned-in



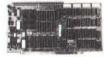
TERACTIVE STRUCTURES Channel A/D card AIO/2

PU BOARDS 

MAINFRAMES Calif. Computer 2200A 12 slot be power supply ENM-C2200
TEL 12 slot table ENM-T12
TEL 22 slot table ENM-T22
Godbout mainfree, ENM-GMF

MEMORY BOARDS 

Digital Research 32K, 2718 proms extrs BDM-DF32 SD Systems Prom-100 programmer BDM-P100



PLOPPY DISK CONTROLLER
Calif. Computer 2422A with
2.3 CPd BDF-C3422
Godboat 'Disk Che 'Geatures the
NEC 785 controller. DMA
arbitration BDF-GDI
Measurement Systems 783 Chip.
Resource of the Controller of the
Polystems Versafloppy II
double density BDF-VF2
Morrow Dosign Disk Jockey II
Morrow Design Disk Jockey II
Morrow Design Disk Jockey II
double density BDF-DJ2 329 419 195

DATEMFACE BOARDS
Calil. Computer 2711 I/O
2 serial 2 per l BUT-C2718
Morew besigns Switchboard
2 serial 4 per l BUT-MSB
Morew besigns Switchboard
3 serial 4 per l BUT-MSB
Morew Designs Multiboard
3 serial 2 per l BUT-MSB
Godbot Interface Cive
2 serial 2 par l BUS-GB
Godbot Interface Two
Godbot Interface Two
1 serial/3 par l BUS-GB 219 275 109

INTERFACE BOARDS

SPECIALITY BOARDS SPECIALITY BOARDS
QT Computer real time clock
catendur HDS - QCK
Artee klee. Wire wrap prototype board HDS-AW
Artee klee. General Purpose
proto board HDS-AGP
Godbout Spectrum color
board HDS-GSC 135 Godbeut Spectrum color board BDS-GSC D. C. Hayes S-100 Micro-moden BDS-HMI Mallen Products extender boa & Ingis: probe ht BDS-MTBI Millien Products Opto-contro-board hii BDS-MCC

25

295

350

Rotron Muffin Fan

\$12.00 @ 10.50 @ 1000 115 VAC. 7 Watts WR2A1

Factory fresh Muffin fans NOT pull-outs. EMF-4M





All merchandise sold by California Digital is premium grade. Shipping: First five pounds \$2.00; each additional add \$.40 Foreign orders 10% shipping. Excess will be refunded. California residents add 6% sales tax. COD's discouraged. Open accounts extended to state supported educational institutions and companies with a "Strong Dun & Bradstreet."

TOLL FREE ORDER LINE (800)421-5041 **TECHNICAL & CALIFORNIA** (212)670.0001

## ALITORNIA

Torrance, California Post Office Box 3097 B

FREE PLASTIC LIBRARY CASE INCLUDED WITH THE PURCHASE OF EVERY BOX OF DISKETTES

Ten boxes 122.75 One hundred boxes 121.50





54" DISKETTES WITH LIBRARY CASE

0) Your Choice

SCOTCH MEMOREX VERBATIM

Soft Sector	10 Sector	16 Sector	
744-0	744.10	744.16	8

SCOTCH	744-0	744-10	744-16	\$26.50
MEMOREX	3401	3403	3405	26.50
VERBATIM	525-01	525-10	NA	26.50
DYSAN	104/1	107/1	NA	39.50

Single Side Double Density

DYSAN	104/1D	107/1D	NA	45.00

Double Side Double Density

SCOTCH	745-0	745-10	745-16	42.50
DYSAN	104/2D	107/2D	NA	49.50
DYSAN 96	204/2D	NA	NA	59.50

#### EIGHT INCH DISKETTES

Single :	Side Single De	nsity	Single Side Double Density							
SCOTCH	740-0	29.50	29.50 SCOTCH 741-0				9.50 SCOTCH 74		39.00	
MEMOREX	3060	29.50	MEMOREX	3090	35.00					
DYSAN	3740/1	39.50	DYSAN	3740/D	57.50					
Thir	ty Two Sector		Double side Double Density							
SCOTCH	740-32	29.50	SCOTCH	743-0	47.50					
Scotch Head Cleaning Nts 5% & 8" 124.95 Plastic Library Cases 5% & 8" 2.95			MEMOREX	3114	39.50					
Diskette Flip Tubs 1 My diskettes 51%* Diskette Flip Tubs 1 My diskettes 8*		24.95 29.95	DYSAN	3740/2D	65.00					

#### PLEASE PHONE FOR VOLUME PRICING.



new BSR timer runs your home just like clockwork. Turns on lamps and liances while your away from home. Completely compatible with your ex-ng System X-10 devices.

Appliance Module 500 W. \$13.95 Lamp Module 300 Watts 12.95 NEW full centrol wall switch 14.50

#### WINCHESTER SUBSYSTEM

naster charge

disk, dual enclosure and power supply.

Floppy backup drive 199.00 additional



64K DYNAMIC	16K STATIC
\$ <b>9.</b> 95	\$13.95
4164 100-	2167 70ns.

**16K DYNAMIC** \$2.10

**2716 EPROM** \$4.95

4116 100-\$1.85 100-\$4.50 1K-\$4.00



#### STATIC

	ea		32+	100+	1K+
21L02	1K	1.19	1.09	1.05	.99
2114	300ns.	2.95	2.75	2.50	1.99
4044-4	450ns.	4.50	4.19	4.00	3.75
4044-2	250ns.	4.95	4.65	4.50	4, 25
6116	18k 24 pin	7.95	7.50	6.75	5.45
2167/8	167 20 pin	11.95	10.75	9.65	9.25

#### **EPROM**

2708	450ns. 3.95	3, 50	3.25	3.00	
2716	5V. 4.95	4.00	3.75	3. 50	
2716	tri-volt 8.50	7.95	7.65	7. 25	
2732	Intel/Hitac. 7.95	7.50	7.00	8.65	
2532	Texas Inst 12.95	11.50	10.00	9.50	
2764	64K Eprom29.95	27.00	25.00	23.50	



Your Choice

sociated with accusing moderns, among cinite is interesting grown sinus-tion to fully present the second section of the second section of the second section of the second section of the section of the section of the sec



BSR





· (.....) ·

GOLD EDGE CONNECTORS

-100 .125" centers msai solder .250" row msai wire wrap (TI) killins Hi-Rel250" kullins Hi-RelW/W	each 82.95 3.95 4.50 5.25	
ullins / Altair . 140"	4,95	4.50
156" Centers (standard)		
2/44 Kim Eyelet	2.50	2.15

INTEGRATED CIRCUIT SOCKETS
Low Profile Wire Wrap Wire Wrap each 100+ \$.46 \$.41 .50 .45 .68 .61 .94 .87 1.60 4.47

DA hooft 2/P 1,50
DB 25P male 2,50
DB 255 female 3,35
DB hood 2/P 1,35
DC37P male 4,20
DC37S female 8,00
DC hooft 2/P 2,25
DD50P male 5,50
DD50S female 9,40
DD50 hooft 2/P 2,50

7.95 8.75 5.75

HIBBON CABLE CONNECTORS 17/34 5" disk 4.85 4.15 3.5 20/40 TRS-80 5.65 5.05 4.7 25/50 8" disk 5.90 5.15 4.3



Eight Inch Disk Drive

		ONE	TWO	TEN
★ OLIVETTI 801	single	\$319	309	295
★ OLIVETTI 802/851	double	425	419	410
SHUGART 801/R	single	395	385	375
SHUGART 851/R	double	525	495	475
QUME DATA TRACK 8	double	525	495	475
The All All and Advances	4/11		- 11 - 0	

★ The 8" Olivetti drives are aprox. 1/2" wider than the Shugarts.

#### Five Inch Disk Drives

OLIVETTI 501/400	single	199	185	175
OLIVETTI 502/451	double	235	225	215

Upon request, all drives are supplied with power connectors and one manual per order.

230 volt 50Hz. 8" add \$50.00 per drive.



Two Olivetti 801 disk drives with power supply, 4" exhaust fan complete in dual enclosure with all necessary power cables. Documentation included. 50 Lbs. CAL-2801

Signal cable add \$35.00 WCA-650D

Same as above but with:

Shugart 801R MSD2801 \*1195 Olivetti 802 CAL2802 31250 Qume DT8 MSD8DT 1450 Shugart 851R MSD2851 1450

Volumn Pricing **Upon Request** 

### Seagate Compatable 7.5 MEGABYTE Winchester Hard Disk Drive

We have priced this so low that the manufacturer has asked not to use their brand name in our advertising.

Industry standard Seagate plug compatable. Drive fits into the same space as a 5%" floppy disk drive. CAL-561/2

#### S-100 MOTHER BOARD

IMSAI 18 Slot CAL-M18

TOLL FREE ORDER LINE (800)421-5041 TECHNICAL & CALIFORNIA

All merchandise sold by California Digital is premium grade. Shipping: First five pounds \$2.00; each additional add \$.40 Foreign orders 10% shipping. Excess will be refunded. California residents add 6% sales tax. COD's discouraged. Open accounts extended to state supported educational institutions and companies with a "Strong Dun & Bradstreet,"

### FLOPPY DISK DRIVES



SPECIAL!!!!!!! QUME DATATRAK 8 Virtually the industry standard. High quality/ reliability. Full featured, double sided, double density.

Tandon TM 848 ..... \$545

\$525 quantity 1, \$499 quantity 2 up.

TANDON DOUBLE SIDED, DOUBLE DENSITY MINIS Compatible with Northstar, Cromemco, TRS-80 \$425

Compatible with Zenith, Heath, etc.

TANDON 51/4" HARD DISKS

TM 603 (10MB).....

#### CONTROLLERS

Tarbell single density kit	\$195	A STATE OF THE PARTY OF THE PAR
Tarbell single density A & T	\$310	
Tarbell double density A & T	\$425	
CCS 2422 w/CPM 2.2	\$350	
Godbout Disk 1	\$450	
MDA MXV-21 LSI-11 controller (RX-0	1, RX-02	compatible) \$1050



#### MISCELLANEOUS

2 Disk drive enclosure . . . . \$ 95 (fits Siemens, Shugart, Qume) CP-206 power supply . . . . \$110 (powers two floppies)

Mini-Enclosure with power supply 1 drive ..... \$ 85 2 drives . . . . . \$120 Cable Kits 2 drives . . . . . \$ 35 3 drives . . . . . \$ 40 4 drives . . . . . \$ 45 Diskettes ss \$39/10 - ds \$59/10

### CPU

\$ 275 \$ 275 

#### MEMORY

CCS 2065 64K dynamic	\$ 595
CCS 2116 32K static	625
Godbout RAM 17 64K	\$ 675
1/0	

#### 1/0

CCS 2710 4 SIO					-			٠				\$ 325
Godbout Interfacer												225
Godbout Interfacer	2						٠			٠	*	\$ 225

#### NEW !!!!

#### **Qume Sprint 9** DAISY WHEEL PRINTER . . \$2395

45 CPS, RO. Available in KSR version.

Call for further particulars.

Ribbons: \$125/case

Bidirectional tractor feed \$225

#### **NEW !!!!**

#### ABM 85 Video Terminal . . \$ 895

- Detachable keyboard
- Televideo 920, ADM 3A compatible
- High resolution green phosphor (23 MHZ)
- Extra multi-bus or S-100 slot for stand-alone capability

Electrolabs —

POB 1608, Palo Alto, CA 94302 (415) 965-7040

......

Terms of sale: cash or checks, MC/ VISA. Min. order \$25. CA residents add 6% tax. Prices subject to change without notice. All goods subject to prior sale

### General Software

Main Offices: 9060 Arrowood Ct. Terre Haute, IN 47802 WE HONOR

**VISA and MASTERCHARGE** 

**TOLL FREE - Outside Indiana** 1-800-457-0517 **ORDER DESKS** (812) 299-2484

Best Selection

Best Service

Write for our famous CATALOG. Contains many items not in ad.

Outside US add \$10 plus additional postage. Add \$3.50 postage and handling per each item. Indiana residents add 4% sales tax. Allow 2 weeks on checks. COD ok. Prices subject to change without notice. All items subject to availability.

ARTIFICIAL INTELLIGENCE	
Disk Manual	
with * Only	
Manual	
Dental (PAS-3)	
Medical (PAS-3)	
ASHTON-TATE	
*dBASE II \$575/50	
BUSINESS PLANNING SYSTEMS	
Plan-80 269/30	
BYROM SOFTWARE	
*DOTALL CLADUE	

*Fabs (B-Tree)	\$159/25
Ultrasort	\$159/25
CONDOR COMPUTER Condor II Condor III	
DIGITAL RESEARCH	
2.2 Intel MDS-800 Northstar (Horizon) Micropolis TRS Model II CB-80 CBasic2	\$149/25 \$169/25 \$159/35 \$459/35
*Super vyx	\$ 89/15
*Micro B + (Specify language)	\$229/20
FINANCIAL PLANNING	. \$223120
*Mini Model	\$449/50
ACCESS 80 I ACCESS 80 II	.\$249 .\$429
FRONTIER SOFTWARE Professional Time Accounting General Subroutine Application Utilities	\$269/40
ISA Spellguard SP/Law	
PASCAL LANGUAGE	
Pascal Z Pascal MT+ V5.5 Compiler SPP Only	\$316/20
KEY BITS Wordsearch String 80	\$ 84/20
String 80 (Source)	\$ 65
*Spellbinder	\$349/45
MICRO AP Selector IV Selector V SBasic	\$469/50

MICRO TAX	
*Level1	\$249
*Level II	\$995
*Level III	\$749
*Combo II + III	\$1495
Microsoft 5.3	49
Run time module	
MICRO PRO	
Wordstar	.\$309/60
WS Training Guide	. 20
WS Custom Notes	\$429/na
MailMerge	\$109/25
WS-Mailmerge	
Datastar	
DS Custom Notes	\$429/na
Calcstar	
Supersort I	\$199/40
Spellstar	\$175/40
Spellstar MICROSOFT	14110110
Basic-80	\$298
Basic Compiler	
Fortran-80	
Cobol-80	\$629
M-Sort	
Macro-80	
Edit-80	
MuSimp/muMath	\$224
Mul iep.80	\$174
MuLisp-80 NORTHWEST ANALYTICAL	40111
*Statpak	\$439/40
OASIS	. 9403/40
"'The Word"	\$ 75
ORGANIC SOFTWARE	
*Textwriter III	\$111/05
*Datebook	
*Milestone	
PEACHTREE SOFTWARE	. 4200100
General Ledger	\$300/40
Accounts Receivable	\$399/40
Accounts Payable	\$399/40
Payroll	
Inventory	300/40
Mailing Address	\$200/40
for P5 Version	
Series 6-Peachtree	900 2119
CPA	\$700W0
Property Mat	\$700(40
Passive Payroll	· 4449/40
	#2040/FF
Sales Tracker	#1000/E0
AH-Sales Analysis	D 1599120

Inventory	\$799/40 \$699/40
REDDING GROUP	\$100/20
*Lynx SOHO GROUP	\$199/20
Matchmaker Worksheet	\$ 97720
SORCOM	
*Pascal/M Z80	\$349/40
Pascal/M 86/88	\$449/40
*Act 68	Φ149/2U
*Act 69	
*Act 86/88	\$149/25
*Trans 86	
*Supercalc	\$269
SOUTHERN COMPUTERS	
*Raid	\$224/35
*Raid FP	\$349/35
*Recover	\$ 75
*RADAR	
ISIS	\$224/20
STRUCTURED SYSTEMS GROU	JP .
General Ledger	\$849/40
Accounts Receivable	
Accounts Payable	
Payroll	\$849/40
Order Entry	\$849/40
Analyst	\$224/25
Letteright	\$159/20
NAD	
Qsort	\$ 89/20
SUPERSOFT	
*Diagnostic II	
*Forth* *SSS Fortran	\$219/30
*Fortran w/RATFOR	\$289/35
*C Compiler	\$175/20
*Disk Doctor	\$ 84/20
*Term I	\$129/25
Term II	\$169/25
Others less 10%	2449/33
WHITESMITHS	
C Compiler	\$600/30
Pascal (incl C)	
Call for catalog and other listings	
ple with Softcard	
pie with dolldard	

\* Available for App

## Orange County • Sunnyvale San Diego • Los Angeles San Fernando Valley • Dallas

BETTER THAN EPSON! - Okidata



Microline 82A 80/132 column, 120 CPS, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking, both serial & parallel interfaces included, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics

PRM-43082 Friction & pin feed .... \$499.95

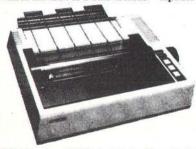
Microline 83A 132/232 column, 120 CPS, handles forms up to 15" wide, removable tractor, plus all the features of the 82A.

PRM-43083 with FREE tractor .... \$744.95

Microline 84 132/232 column, 200 CPS, full dot graphics built in, handles forms up to 15" wide, plus all the features of the 83A.

PRM-43083	with FREE tractor \$1149.95
PRA-27081	Apple card \$39.95
PRA-27082	Apple cable \$19.95
PRA-27087	TRS-80 cable \$24.95
PRA-43081	2K hi spd serial card \$169.95
PRA-43082	Graphics ROMs 82A \$79.95
PRA-43083	Graphics ROMs 83A \$79.95
PRA-43088	Tractor option 82A \$39.95
PRA-43080	Extra ribbons pkg. of 2 \$9.95

#### INEXPENSIVE PRINTERS - Epson



MX-70 80 column, 80 CPS, 5 x 7 dot matrix, adjustable tractor feed, & graphics

PRM-27070 List \$459 ..... \$389.95 MX-80 80 column, 80 CPS, bi-directional/logic seeking

printing, 9 x 9 dot matrix, adjustable pin feed, & 64 raphics characters

PRM-27080 List \$645 ..... \$429.95

MX-80FT same as MX-80 with friction feed added.

PRM-27082 List \$745 ..... \$529.95

**MX-100** 132 column, correspondence quality, graphics, up to 15" paper, friction feed & adjustable pin feed, 9 x 9 dot matrix, 80 CPS.

PRM-27100	List \$945 \$724.95	
PRA-27084	Serial interface \$54.95	
PRA-27088	Serial intf & 2K buffer \$144.95	
PRA-27081	Apple card \$39.95	
PRA-27082	Apple cable \$19.95	
PRA-27086	IEEE 488 card \$52.95	
PRA-27087	TRS-80 cable \$24.95	
PRA-27085	Graftrax II \$75.00	
	Extra print head \$44.95	
	MV 90 wikhow want 612.05	

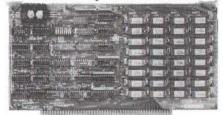
#### 16K RAM Card for Apple II was \$175, Now Only \$74.95

Expand your Apple's memory from 48K to 64K with this assembled & tested RAM Card that just plugs right into your Apple. Take advantage of this half price sale !!!

MEX-16700A 16K RAM Card ...... \$74.95

#### SD Systems ExpandoRAM III

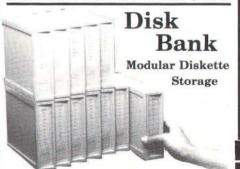
64K to 256K expandable RAM board



SD Systems has duplicated the famous reliability of their ExpandoRAM I and II boards in the new ExpandoRAM III, a board capable of containing 256K of high speed RAM. Utilizing the new 64K x 1 dymanic RAM chips, you can configure a memory of 64K, 128K, 192K, or 256K, all on one S-100 board. Memory address decoding is done by a programmed bipolar ROM so that the memory map may be dip-switch configured to work with either COSMOS/MPM-type systems or with OASIS-type systems.

Extensive application notes concerning how to operate the ExpandoRAM III with Cromemco, Intersystems, and other popular 4 MHz Z-80 systems are contained in the manual.

MEM-65064A	64K A & T	\$424.95
MEM-65128A	128K A & T	\$494.95
MEM-65192A	192K A & T	\$559.95
MEM-65256A	256K A & T	\$595.00



The Disk Bank system is a revolutionary diskette storage concept designed to handle all your diskette storage needs no matter how small or large.

The Disk Bank system can grow as your storage needs grow. Its modular interlocking design allows you to add to your system horizontally or verticallly. And Disk Bank's design allows easy accss to your diskettes. Just open the drawer and slide it out. The diskette retaining gate falls forward automatically for easy access to any of the 10 diskettes, without fear of bending or crimping. Shipping weight 1 lb.

MMA AOS 51/" Dich Bank

Modems on Sale !!!!



#### SIGNALMAN - Anchor

Direct-connect automatic answer/originate selection, 300 Baud full duplex, Bell 103, includes RS-232 cable

IOM-5600A Signalman ..... \$98.50

#### **SMARTMODEM - Hayes**

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable IOM-5400A Smartmodem ...... \$249.95 IOK-1500A Hayes Chronograph ... \$219.95 IOM-2010A Micromodem II ...... \$329.95

#### IOM-1100A Micromodem 100 ..... \$375.00 Apple-CAT - Novation

Software selectable 1200 or 300 Baud, direct connect, autoanswer/auto-dialse dialing, auxiliary 3-wire RS-232C serial

IOM-5232A Save \$50.00 ..... \$325.00

### FMJ Inc **Printer Pal**







P80 dimensions: 141/2" wide, 13" deep, 41/2" high • P100 dimensions: 21" wide, 13" deep, 51/2"high Stores paper below printer . Constructed of 16 gauge steel . Attractive textured finish . Plastic trim and rubber feet . Adjustable paper support

The Printer Pal is a very simple, but convenient paper rack and printer stand. The Model P80 will support an 80 column printer such as the Epson MX80/MX80FT or the Okidata 82A. The Model P100 supports the larger 132 column printers like the Epson MX100 or the Okidata 83A. Either model performs the same function; to act as a stand for your printer while keeping your paper straight and tidy so you can spend your time computing instead of realigning your printer

PRA-99080 P80, 10 lbs ..... \$24.95 PRA-99100 P100, 12 lbs ...... \$29.95

#### Place Orders Toll Free

Continental U.S.

Inside California

800-421-5500

800-262-1710

For Technical Inquires or Customer Service call:

213-973-7707

### Computer Products

4901 W. Rosecrans, Hawthorne, Ca 90250

TERMS of SALE: Cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. Minimum Order \$15.00. California residents add 6% tax. Minimum shipping & handling charge \$3.00.

### JA IDIS

**Computer Products** 3313 S. Bristol St. Santa Ana, Calif. 714-549-7108

### **Computer Products**

1291 W. El Camino Real Sunnyvale, Calif. 415-965-7980

**Computer Products** 4344 Convoy Street Kearny Mesa, Calif. 714-268-4661

### PLACE ORDERS TOLL FREE.

Continental U.S. - 800-421-5500 Inside California - 800-262-1710 Los Angeles Area - 213-973-7707

### Disk Sub-Systems

Shugart, Siemens, Qume



Handsome metal cabinet with proportionally balanced air flow system . Rugged dual drive power supply . Power cable kit . Power switch. line cord, fuse holder, cooling fan . Never-Mar rubber feet . All necessary hardware to mount 2-8" disk drives, power supply, and fan • Does not include signal cable

#### Dual 8" Subassembly Cabinet

END-000420	Bare cabinet	. \$59.95
END-000421	Cabinet kit	\$225.00
END-000431	$A \& T \dots \dots$	\$359.95

#### 8" Disk Drive Subsystems Single Sided, Double Density

END-000423 Kit w 2 FD100-8Ds . \$924.95 END-000424 A & Tw 2 FD100-8Ds \$1124.95 END-000433 Kit w 2 SA-801Rs ... \$999.95 END-000434 A & Tw-2 SA-801Rs \$1195.00

#### 8" Disk Drive Subsystems Double Sided Double Density

Double	Stucu, Double Dens	ally
END-000426	Kit w 2 DT-8s	\$1224.95
END-000427	A & Tw 2 DT-8s	\$1424.95
END-000436	Kit w/2 SA-851Rs	$\$1\overline{2}95.00$
END-000437	A & Tw/2 SA-851Rs	\$1495.00

#### DISKETTES - Jade





We proudly put our name on these high quality diskettes guaranteed to satisfy you or your money back.

#### 51/4" Disbettes Box of Ten

MMD-5110103	SS, SD, 01S	\$29.00
MMD-5111003	SS, SD, 10S	\$29.00
MMD-5111603	SS, SD, 16S	\$29.00
MMD-5120103	SS, DD, 01S	\$31.00
MMD-5121003	SS, DD, 010	\$31.00
MMD-5121603	SS, DD, 16S	\$31.00

#### 8" Dishettes Box of Ten

O Litor	rettes, Dox of Ten	
MMD-8110103	SS, SD, 01S	\$31.00
MMD-8120103	SS, DD, 01S	\$39.00
MMD-8220103	DS DD 018	\$48.00

#### **EPROM ERASER - Spectronics**

Ultra-violet EPROM erasers XME-3100A With out timer ..... \$69.50 XME-3101 With timer ..... \$94.50 XME-3200 Economy Model ...... \$39.95

#### 16K MEMORY UPGRADE

Add 16K of RAM to your TRS-80, Apple, or Exidy in just minutes. We've sold thousands of these 16K RAM upgrades which include the appropriate memory chips (as specified by the manufacturer), all necessary jumper blocks, fool-proof instructions, and our 1 year guarantee. MEX-16100K TRS-80 kit ..... \$25.00 MEX-16101K Apple kit ...... \$25.00 MEX-16102K Exidy kit ..... \$25.00

#### 16K RAM CARD - for Apple II

Expand your Apple to 64K, 1 year warranty MEX-16700A Save \$125.00 !!! ...... \$74.95

#### Z-80\* CARD for APPLE

Two computers in one, Z-80 & 6502, more than doubles the power & potential of your Apple, includes Z-80\* CPU card, CP M 2.2. & BASIC-80

CPX-30800A A & T ..... \$299.95

#### 8" DISK CONTROLLER

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CPM 2.2, Shugart & Qume compatible IOD-2700A A & T ..... \$499.95

#### 2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply. & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal

1 MegaByte Package (Kit)		\$1495.00
1 MegaByte Package (A &	T)	\$1695.00
2 MegaByte Package (Kit)		\$1795.00
2 MegaByte Package /A &	T	\$1995.95

#### Apple-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for

IOM-5232A Save \$50.00!!! . . . . . \$334.95

#### DISK DRIVES - Micro Sci

Inexpensive disk drives for your Apple

A2 Direct replacement for Apple Disk II, works with Apple II controller as first or second drive.

MSM-123101 Micro Sci A2 ...... \$429.95 MSM-123101C A2 with contrlr .... \$499.95

A40 40 track drive for Apple II. Improved storage capacity and speed over Apple Brand drives requires Micro Sci controller.

IOD-2340A Micro Sci A40 ..... \$399.95

A70 70 track drive for Apple II. Twice the storage capacity and three times faster than Apple Brand drives requires Micro Sci controller

IOD-2370A Micro Sci A70 ..... \$499.95

Micro Sci Controller Disk controller for up to two Micro Sci A40 or A70 disk drives, DOS 3.2, 3.3, Pascal, and Z-80 SoftCard compatible, includes utility disk and 40/70

IOD-2300A Micro Sci controller ..... \$95.00

#### VISION 80 - Vista Computer

80 column x 24 line video card for Apple II, 128 ASCII characters, upper and lower case, 9 x 10 dot matrix with 3 dot descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz

IOV-2400A Vista Vision 80 ...... \$375.00

#### Joystick - T G Products

A better joystick for your Apple II SYA-1512A A & T ..... \$49.95

#### CPS MULTICARD - Mtn. Computer

Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card. IOX-2300A A & T ..... \$179.95

### Ccommodore VIC-20 Computer



omplete personal computer with 5K RAM, full color, 61 key keyboard, 4 dual special-function keys, serial ports, cassette port, composite video output (connects to standard color TV set), BASIC language, & expansion port.

COM-VIC20 VIC-20 ......

#### Z-80 STARTER KIT - SD Systems

Complete Z-80 microcomputer with RAM, ROM, I/O, keyboard, display, kludge area, manual, & workbook CPS-30100K KIT \$299.95 CPS-30100A A & T ..... \$469.95



#### AIM-65 - Rockwell

6502 computer with alphanumeric display, printer, & keyboard, and complete instructional manuals

CPK-50165A 1K AIM-65 \$424.95
CPK-50465A 4K AIM-65 \$474.95
SFK-74600008E 8K BASIC ROM \$64.95
SFK-64600004E 4K Assembler ROM \$43.95
PSX-030A Power Supply \$64.95
ENX-000002 Enclosure \$54.95
SFK-74600020E PL/65 ROM \$84.95
SFK-74600010E Forth ROM \$64.95
SFK-74600030E Instant Pascal \$99.95

#### Special Packages

4K AIM-65, 8K BASIC, power supply & enclosure 

### Video Monitors

#### HI-RES 12" GREEN - Zenith

to MHz bandwidth, 700 lines inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable. VDM-201201 List price \$150.00 .... \$118.95

#### 12" GREEN SCREEN - NEC

20 MHz, P31 phosphor video monitor with audio, exceptionally high resolution - A fantastic monitor at a very reasonable price

VDM-651200 Special Sale Price ..... \$169.95

#### 12" COLOR MONITOR - NEC

Hi-res monitor with audio & sculptured case VDC-651212 Color Monitor ...... \$479.95 NEC-1202D RGB color monitor ... \$1045.00

#### Leedex / Amdek

Reasonably priced video monitors VDC-801310 13" Color 1 ..... \$379.95

\$895.00 IOV-2300A DVM board for Apple .. \$199.95

Computer Products 13440 S. Hawthorne Blvd. Hawthorne, Calif.

213-973-7330

Computer Products 21800 Ventura Blvd. Woodland Hills, Calif. 213-716-6120

Computer Products 4950 Beltline Road Addison, Texas 214-458-2782

### PLACE ORDERS TOLL FREE.

Continental U.S. - 800-421-5500 Inside California - 800-262-1710 Los Angeles Area - 213-973-7707

4 MHz Z80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included. CPC-30200A A & T ..... \$299.95

#### THE BIG Z\* - Jade

2 or 4 MHz switchable Z-80\* CPU with serial I/O. accomodates 2708, 2716, or 2732 EPROM, baud rates from 

 CPU-30201K Kit
 \$139.95

 CPU-30201A A & T
 \$189.95

 CPU-30200B Bare board
 \$35.00

#### 2810 Z-80\* CPU - Cal Comp Sys

2/4 MHz Z-80A\* CPU with RS-232C serial I/O port and onboard MOSS 2.2 monitor PROM, front panel compatible. CPU-30400A A & T ..... \$269.95

#### CB-2 Z-80 CPU - S.S.M.

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300K	Kit	\$239.95
CPU-30300A	$A & T \dots \dots \dots$	\$299.95

#### 16K STATIC RAM - Mem Merchant

4 MHz 16K static RAM board, IEEE S-100, bank selectable, Phantom capability, addressable in 4K blocks, "disable-able" in 1K segments, extended addressing, low power MEM-16171A A & T ...... \$154.95

#### 32K STATIC RAM - Jade

2 or 4 MHz expandable static RAM board uses 2114L's MEM-16151K 16K 4 MHz kit ..... \$169.95 MEM-32151K 32K 4 MHz kit ...... \$299.95 Assembled & tested . . . . . add \$50.00

#### MEMORY BANK - Jade

 $4\,MHz, S-100, bank\, selectable, expandable from\, 16K\, to\, 64K$ MEM-99730B Bare Board ...... \$49.95 MEM-99730K Kit no RAM ...... \$199.95 MEM-32731K 32K Kit ..... \$239.95 MEM-64733K 64K Kit ...... \$279.95

#### Assembled & Tested ..... add \$50.00 64K RAM - Calif Computer Sys

4 MHz bank port / bank byte selectable, extended addressing, 16K bank selectable, PHANTOM line allows memory overlay, 8080 / Z-80 / front panel compatible. MEM-64565A A & T ..... \$575.00

#### 64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4-16K banks, up to 8MHz MEM-64400A A & T ..... \$594.95

#### 64K STATIC RAM - SSM

#### 64K STATIC - Lab Standard

Absolute IEEE 696/S-100 compliance, 8 or 16 Bit data paths, 16-bit request/acknowledge properly implemented, supports DMA at 8MHz, switchable bank select system for use with Cromemco & Alpha Micro MEM-64900A A & T ..... \$699.95

#### BUS PROBE - Jade

\$-100 diagnostic analyzer board, dynamic visual display of all 96 IEEE S-100 signals, aids in real time analysis of faulty

TSX-200B			 	\$59.95
<b>TSX-200K</b>	Kit		 	\$119.95
TSX-200A	A &	T	 	\$149.95

#### VERSAFLOPPY II - SD SYSTEMS

Double density disk controller for any combination of 51/1" or 8" single or double sided disk drives, analog phase-locked loop data separator, vectored interrupt, CP/M 2.2 & OASIS compatible, control/diagnostic software PROM included 

#### DOUBLE-D - Jade

Double density controller with the inside track, on-board Z-80A\*, printer port, IEEE S-100, can function on an interrupt driven buss

IOD-1200K	Kit	\$299.95
IOD-1200A	A & T	\$375.00
IOD-1200B	Bare board	. \$59.95

#### DOUBLE DENSITY - Cal Comp Sys

51/3" and 8" disk controller, single or double density, with on-board boot loader ROM, and free CP/M 2.2\* and

IOD-1300A	A &	T		\$374.95
-----------	-----	---	--	----------

#### MPC-4 - SD Systems

Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system

#### IOI-1504A A & T w/software ..... \$495.00

#### I/O-4 - S.S.M.

2 serial I/O ports plus 2 parallel I/O ports IOI-1010B Bare board ..... \$35.00

#### I/O-5 - SSM Microcomputer

Two serial & 3 parallel I/O ports, 110-19.2K Baud IOI-1015A A & T ..... \$279.95

#### I/O-8 - SSM Microcomputer

Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems IOI-1018A A & T ..... \$449.95

#### PROM-100 - SD Systems

2708, 2716, 2732 EPROM programmer w/software MEM-99520K Kit ...... \$189.95 MEM-99520A A & T ..... \$249.95

#### PB-1 - S.S.M.

2708, 2716 EPROM board with built-in programmer MEM-99510K *Kit* ...... \$154.95 MEM-99510A *A* & *T* ...... \$219.95

#### EPROM BOARD - Jade

16K or 32K uses 2708's or 2716's, 1K boundary MEM-16230K Kit ...... \$79.95 MEM-16230A A & T ..... \$119.95

#### ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard

6 Slot (5¼" x 8%")
Bare board \$19.95
Kit \$39.95
A & T \$49.95
12 Slot (9%" x 8%")
Bare board \$29.95
Kit \$69.95
A & T \$89.95
18 Slot (14½" x 8¾")
Bare board \$49.95
Kit \$99.95
A & T \$139.95

Prince may be elightly higher at our retail locations. Places call the store negreet you for

### Single User System

SBC-200, 64K ExpandoRAM II, Versafloppy II, CP/M 2.2

4 MHz Z-80A CPU, 64K RAM, serial I/O port, parallel I/O port, double-density disk controller, CP/M 2.2 disk and manuals, system monitor, control and diagnostic software.

Board set with 256K of RAM .... \$1295.00

### -All boards are assembled and tested-



Shugart SA801R single-sided double-density MSF-10801R .. \$394.95 ea 2 for \$389.95 ea

Shugart SA851R double-sided double-density MSF-10851R . . \$554.95 ea 2 for \$529.95 ea

Qume DT-8 double-sided double-density MSF-750080 .. \$524.95 ea 2 for \$499.95 ea

Siemens FDD 100-8 sngl-sided dbl-density

MSF-201120 .. \$384.95 ea 2 for \$349.95 ea

Shugart SA400L sngl-sided dbl-density 40 track MSM-104000 . \$234.95 ea 2 for \$224.95 ea

Shugart SA450 dbl-sided dbl-density 70 track MSM-104500 .. \$349.95 ea 2 for \$329.95 ea

Qume DT-5 dbl-sided dbl-density 80 track MSM-750050 . . \$359.95 ea 2 for \$349.95 ea

MPI B-51 sngl-sided dbl-density 40 track

MSM-155100 . . \$234.95 ea 2 for \$224.95 ea MPI B-52 dbl-sided dbl-density 40 track

MSM-155200 .. \$344.95 ea 2 for \$334.95 ea

MPI B-91 sngl-sided dbl-density 77 track MSM-155300 .. \$369.95 ea 2 for \$359.95 ea

MPI B-92 dbl-sided dbl-density 77 track MSM-155400 . . \$469.95 ea 2 for \$459.95 ea

#### ISOBAR - GSC



Isolates & protects your valuable equipment from high voltage spikes & AC line noise, inductive isolated ground, 15 amp circuit breaker, U.L. listed

EME-115103	3 socket		\$39.50
EME-115105	4 socket		\$49.50
EME-115100	8 socket		\$54.50
EME-115110	9 socket	rackmount	\$74.50

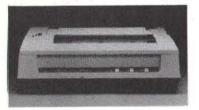
PALOMAR TAKES THE RISK
....Join the thousands of satisfied customers who buy from
fast response, expert technical help, and



#### NEC-8023 A

High-resolution dot graphics. Proportional spacing. Correspondent quality printing. Bidirectional tractor and friction feed. 80. 132 col. Greek and math symbols. 100 cps matrix

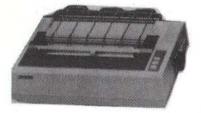
List \$780 Parallel ..... \$599



#### C. ITOH

Pro/Writer offers 8 character sizes, 5 different alphabets, and high proportional spacing, bidirectional, vert. and horiz. tabs, resolution graphics. nx9 matrix, 100 cps 136 col. max. Friction and tractor feed.

8510R Serial ...... \$599



#### EPSON-COMPLETE STOCK!

Features disposable print heads, Graphtrax, All models except MX-70 print text in two directions. MX-80F/T and MX 100 have both friction and tractor feed. Unparalleled dot placement accuracu

accuracy.	
MX-70 (80 col.)	CALL
MX-80 (80 col.)	CALL
MX-80F/T (80 col.)	CALL
MX-100 (136 col.)	CALL
Interface Cards	
Cables	

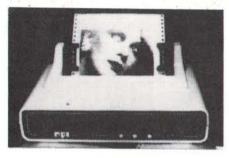
#### VIDEO TERMINALS, MONITORS

Ampex Dialog 80												٠	٠		\$995
Ampex Dialog 30										٠					\$795
															\$845
Televideo 950									*						\$995
SOROCIQ 120 .															\$699
Zenith 12" Green											٠				\$119
NEC 12" Green															\$169
Amdex 12" B/W (L	e	e	d	le	×	()									\$99
Amdex 13" Color L	c	-	R	e	s	Ž						į,		ċ	\$439



#### LOW, LOW PRICE ON NOVELL!

Heavy duty, 150 CPS, bidirectional, tractor feed. 9x9 dot matrix, 6 or 8 lines per inch, 10, 13,6 or 16.5 CPI, EIA RS-232C or parallel interface.



#### MPI 88G/99G MATRIX

High resolution dot-addressable graphics for Apple. Enhanced "correspondence quality" printing. Tractor and friction feed. Serial and Parallel Input. 100 cps Bi-directional printing.

88 G (132 col.) List \$749	\$549
99 G (132 col.) List \$849	\$599
Apple parallel I/O Card/Cable/Disk	\$110
with Graphics Prom (Ap-Pak)	\$145
IEEE I/O Card	\$55
Single Sheet Feeder	\$25
QT Cover	

#### **OKIDATA**

UP TO 200 CPS!

Microline 82A-80/132 col., 120 CPS, 9x9 dot matrix, friction, pin feed or tractor feed (removeable) rear and bottom feed, Includes bidirectional/logic seeking, serial and parallel interfaces. Double width and condensed characters, true lower case descenders and graphics.

82A \$545
Microline 83A – 132/232 col., 120 CPS, handles forms up to 15 in. wide, plus all the features of
the 82A. \$775
Microline 84—132/232 col., 200 CPS, with full dot graphics built-in. Takes forms up to 15 in.
wide, plus all the features of the 83A. 84SP\$1250

#### MODEMS

UDS 103 LP, direct	ě.					\$169
103 JLP Auto Answer	*	 *				\$209
202 LP 1200 BAUD						
<b>NOVATION CAT, acoustic</b>						\$145
D-CAT, direct						\$155
Auto Cat						\$219
Apple Cat	į.					\$329
HAYES S100 Micromodem						\$349
Annle Micromodem						

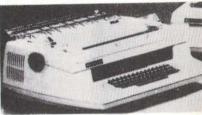
Smart Modem ..... \$245



#### **ADLER**

17.5 CPI, 10, 12, 15 and proportional spacing line correcting memory, inter-changeable pr

SE1010 List \$1295 ..... SAVE \$3 Interface Card ...... ADD \$3



#### NEC SDINWRITERS

111	OLI	1 1 44	, ,		_	4,1	••	,		
7710/7730 RO	w/tra	ctor	¥						57	25
7720 KSR w/tra										29
3510/3530 RO										17
Bidirectional t										\$2
Push tractor										\$3



#### **OLYMPIA**

Letter quality. Daisy wheel printer typew interfaces to Apple. Atari, NEC. TRS80 RS232 Serial ports.

ES 100 RO Computer printer List \$1690 ..... ES100 Typewriter only List \$1195 SAVE \$ Interface Card Only ..... (specify serial or parallel I/O Cable (specify serial or parallel) . . . . . Apple Serial Card . . . . . . . . . . . . . \$

#### MODEMS

BIZCOMP Super low introductory price. over other modems! Apple—direct connec game port. No serial card needed. Save \$1 more. Atari-direct connect via inte module and telelink cartridge. Commod the only modem available. Each pkg. con cable with connectors and phone T-adap Apple Comm Pkg .....

VIC Comm Pkg .....

Atari Comm Pkg .....

## OUT OF MAIL ORDER BUYING! Is with confidence and know you'll receive the same Juaranteed satisfaction — at UNBEATABLE PRICES!

#### APPLE SOFTWARE

	L
BUSINESS	
Financial Partner	\$191.99
Pascal Tutor	\$97.99
Pro Easy Writer	\$196.99
asy Writer 40 col	
Ward Star (Req. Softcard)	\$241.99
Super Sort (Req. Softcard)	\$129.99
Nail Meger (Req. Softcard)	\$80.99
Pata Star (Req. Softcard)	\$192.99
pell Star (Req. Softcard)	\$129.99
alle Star (Req. Softcard)	\$129.99
uper Tex II	\$117.99
he Address Book	
orm Letter Module	
isifiles	\$229.99
esktop Plan III	\$275.99
esktop Plan II	\$229.99
isiplot	\$185.99
isitrend/Visiplot	\$275.99
isidex	\$229.99
isiterm	\$89.99
isicalc 3.3	\$229.99
fotory	\$199.99
uperspell (Req. Softcard)	\$435.99
ord Processor (Req. Softcard)	\$255.99
PERSONAL/HOME	
ping Tutor	\$19.99
ementry Math	\$31.99
ersonal Filing System	\$74.99
ersonal Report System	\$74.99
gebra I	
pmpu-Math: Arithmetic Skill	
pmpu-Math: Fractions	\$31.99
pmpu-Math: Decimals	
propu-Spens: (Reg. Data Disk)	\$23.99
pmpu-Spells: (Reg. Data Disk) MISC	\$23.99
MISC	
MISC pplesoft Compiler	\$165.99
MISC pplesoft Compilerasic Compiler	\$165.99 \$315.99
MISC pplesoft Compiler asic Compiler pple-Doc	\$165.99 \$315.99 \$41.99
MISC pplesoft Compiler asic Compiler pple-Doc B. Master	\$165.99 \$315.99 \$41.99 \$189.99
MISC pplesoft Compiler asic Compiler pple-Doc B. Master B. Utility Pack	\$165.99 \$315.99 \$41.99 \$189.99
MISC pplesoft Compiler asic Compiler pple-Doc B. Master B. Utility Pack GAMES	\$165.99 \$315.99 \$41.99 \$189.99 . \$81.99
MISC pplesoft Compiler asic Compiler pple-Doc B. Master B. Utility Pack GAMES ster Blaster	\$165.99 \$315.99 \$41.99 \$189.99 .\$81.99
MISC pplesoft Compiler asic Compiler pple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller	\$165.99 \$315.99 \$41.99 \$189.99 . \$81.99 \$24.99 . \$9.99
MISC pplesoft Compiler asic Compiler pple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai	\$165.99 \$315.99 \$41.99 \$189.99 . \$81.99 \$24.99 . \$9.99 \$31.95
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$9.99 \$31.95 \$15.99
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower	\$165.99 \$315.99 \$41.99 \$189.99 .\$81.99 \$24.99 .\$9.99 \$31.95 \$15.99
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prioc's Tower scue at Rigel	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$9.99 \$31.95 \$15.99 \$15.99 \$23.99
MISC pplesoft Compiler usic Compiler pple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$9.99 \$31.95 \$15.99 \$23.99 \$31.99
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. (Itility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel II Fire Warrior ar Warrior	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$9.99 \$31.95 \$15.99 \$23.99 \$31.99 \$31.99
MISC pplesoft Compiler asic Compiler pple-Doc B. Master B. (Itility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel II Fire Warrior ash, Crumble and Chomp	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$23.99 \$31.99 \$31.99 \$23.99
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$23.99 \$31.99 \$23.99 \$23.99 \$15.99
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$31.99 \$31.99 \$31.99 \$15.99 \$15.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack	\$165.99 \$315.99 \$41.99 \$189.99 .\$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$31.99 \$23.99 \$15.99 \$15.99 \$15.99 \$23.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner	\$165.99 \$315.99 \$41.99 \$189.99 .\$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$31.99 \$31.99 \$15.99 \$15.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn orloc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$31.99 \$31.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prioc's Tower scue at Rigel II Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$23.99 \$31.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99
MISC pplesoft Compiler sic Compiler pple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$9.99 \$31.95 \$15.99 \$31.99 \$31.99 \$23.99 \$15.99 \$15.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn proc's Tower scue at Rigel Il Fire Warrior ar Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$9.99 \$31.95 \$15.99 \$31.99 \$23.99 \$15.99 \$15.99 \$23.99 \$15.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk I nk II bot Wars ree Mile Island 3,M.	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$23.99 \$15.99 \$23.99 \$23.99 \$23.99 \$31.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island 3.M. stle Wolfenstein	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prioc's Tower scue at Rigel Il Fire Warrior ar Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island B.M. ste Wolfenstein ard and Princes	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$31.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$23.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prloc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island B.M. stle Wolfenstein ard and Princes sile Defense	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$31.99 \$15.99 \$23.99 \$15.99 \$23.99 \$15.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn orloc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island 3.M. ste Wolfenstein ard and Princes ssile Defense inston Manor	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$31.99 \$23.99 \$15.99 \$23.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prioc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island 3.M. ste Wolfenstein ard and Princes sille Defense inston Manor rp Destroyer	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$23.99 \$15.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn proc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island B.M. stle Wolfenstein ard and Princes sile Defense inston Manor pp Destroyer per Strike	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$23.99 \$15.99 \$23.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99
pplesoft Compiler sic Compiler sple-Doc B. Master B. Utility Pack  GAMES ster Blaster Traffic Controller mple of Apshai testones of Ryn prioc's Tower scue at Rigel Il Fire Warrior ar Warrior ash, Crumble and Chomp per Reaches of Apshai e Keys to Acheron ack Attack e Prisoner nk I nk II bot Wars ree Mile Island 3.M. ste Wolfenstein ard and Princes sille Defense inston Manor rp Destroyer	\$165.99 \$315.99 \$41.99 \$189.99 \$81.99 \$24.99 \$31.95 \$15.99 \$31.99 \$23.99 \$15.99 \$23.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$31.99 \$23.99 \$31.99 \$31.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99 \$23.99



#### APPLE ACCESSORIES

	OF	

Z80 Softcard \$299.99
16K RAMcard \$158.99
CCS
Parallel Card \$119.99
A5YNC Serial Card \$148.99
Clock Calender Card \$99.99
IEEE Card \$249.99
A-D Card \$99.99
MOUNTAIN COMPUTERS
Romolus
Keyboard Fitter Rom \$49.99
CPS Multifunction Card \$189.99
Super talker \$229.99
PAYMAR
L/C Adapter-New \$35.99
L/C Adapter-Old \$45.99
Videx-Video Term \$299.99
ADVANCE BUSINESS TECH
13 Key pad for Apple (New KBD) \$110.99
13 Key pad for Apple (Old KBD) \$110.99
BAR Code Reader \$189.99
Dana-Cooling Fan\$39.99
Lazer-Lower Case Adapter \$55.99
T.G. PROD.
Game Paddles \$31.99
Joy Stick \$46.99
Select A Port \$46.99
Wizard-80 (80 col.) \$278.99
<u></u>

#### RS232 CABLES

4 wire male-male 10 ft	\$19.99
9 wire male-male 10 ft	\$21.99
4 wire male-female 10 ft	\$19.99
9 wire male-female 10 ft	\$21.99
RS232 Switch Box (Use 2 terminals or	printers
from one output port)	109.99

#### FAN FOLD PAPER

(Prices F.O.B. S.P.)

91/2x11-20# Bond White (2700 ct.)	\$30.10
14%x11-20# Bond White (2400 ct.)	\$37.10
14%x11-20# Bond 1/2" Green Bar	
(2400 ct.)	\$37.10

#### **RIBBONS**

NEC	\$77/Doz.
Qume	\$45/Doz.
Diablo	\$66/Doz.
Anadex \$	135/6 ea.
Tritel	\$95/Doz.
TI/DEC/TTY	
Epson \$	
MPI/Axiom/Base 2 \$	13.95/ea.

#### MAGNETIC MEDIA

Premium Quality At Bargain Prices 100% Certified with hub rings, box of 10

	Leonothy Diskettes	
51/4"	SSSD Soft, 10 or 16 sector	\$25.00
	SSSD Soft, 10 or 16 sector	\$28.50
	DSDD Soft, 10 or 16 sector	\$36.00
	Quality Diskettes	
51/4"	SSD Soft 10 or 16 sector	\$27.00

51/4" SSD, Soft 10 or 16 sector	\$27.00
SSDD, Soft 10 or 16 sector	\$32.00
DSDD, Soft 10 or 16 sector	\$38.50
8" SSSD, Soft or 32 hard sector	\$28.50
DSDD, Soft or 32 hard sector	\$45.50
0411 6	

CALL for prices on name brand diskettses: VERBATIM DYSAN 3M SCOTCH MEMOREX WABASH MAXELL



- z-80A CPU 4 MHz
- 5 user programmable function keys
- 82 Keys with numeric keypad
- 160 x 100 resolution
- 80 character screen

PCX-8001A Microcomputer w/32K RAM	\$899
PC-8012A I/O Unit w/32K RAM	
Expansion slots	\$599
DC GGGT A D I MI-I DI-I. D. I. III	6000

PC-8031A Dual Mini-Disk Drive Unit \$899 PC-8032A Add-On Dual Mini Disk Drive Unit ..... \$799

#### ATARI SOFTWARE

Adventure # 1,2,3, (D)	\$31.99
Adventure #4,5,6, (D)	\$31.99
Adventure #7,8,9 (D)	\$31.99
Adventure #10,11,12 (D)	\$31.99
Adventure 1-12 (D)	\$79.99
Atari Mailing List (D)	\$19.99
Text Wizard (D)	\$79.99
Compu-Math/Fractions (D)	\$31.99
Compu-Math/Decimals (D)	\$31.99
Compu-Math/Fractions (D)	\$23.99
Compu-Math/Decimals (C)	\$23.99
Letter Perfect (D) \$	119.99
Mail Merge/Utility (D)	

TO PLACE YOUR ORDER CALL:

TELEPHONE (714)744-7314

CODE: BApr82 or write to:

TELEX 697120

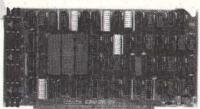
910-105 W. San Marcos Blvd., San Marcos, CA 92069

TERMS OF SALE: Cash, check, money order, bank wire transfer, credit card or purchase orders from qualified firms and institutions.

Please include telephone number with order and expiraton date on credit card orders. California residents add 6% sales tax. Advertised prices are for prepaid orders F.O.B. shipping point. Add 3% for shipping in U.S. Pricing and availability subject to change without

Circle 326 on inquiry card

ONE



#### CO - PROCESSOR 8086 - 8087 COMPUPRO

PART NO.	DESCR	PTION	LIST PRICE	OUR PRICE
BE GBT185A	A&T 808	6 Only	\$695.00 \$850.00	\$825.00
BEGBT186C	CSC 808	6 Only	\$850.00	\$765.00
BE 68T8087	8087 Ch	p		CALL
		CPU-Z - G	ODBOUT	
	2/4 MHZ	Z80 CPU	24 Bit Addressi	ng
BEGBT 160A	A & T		\$295.00	\$280.00
			\$395.00	
DUA	L PROCE	SSOR 8085	-8088 - COMPU	PRO
6 or 8 MZ	Provides	true 16 Bit bit S-100	Power with a sta	andard 8
<b>BESST 1512</b>	A A&T	6 MHZ	\$425.00	\$399.00
BE68T 1612	c CSC	6/8 MHZ	\$525.00.	\$498.00
TIME! 8 A BEGSTMPMS	ND/OR 10 116 ee Compu	S BIT TOGE Soft pro AD in N	d MPM86™ AT TI THER! WOW! ware May BYTE for detail VE, 3500% FAST	\$995.00
			est Thing For Co	
			ails on M-Drive.	
ALCOHOLD STREET			COMP. SYST.	
2/4 MHZ	Z Z80A (	PU with I	RS232C Serial	I/O Port
complete	with Mo	nitor PRON	A for 2422 Disk C	ontroller
			\$350.00.	
	CI	32 Z80 CPU	J - S.S.M.	
2/4	MHZ will	accept 27	16, or 2732, or	RAM
ment in the case in the same				

### BESSMZ80M SSMZ80 Monitor ......\$89.00 **S-100 I/O BOARDS**

BESSMCB2K Kit. \$280.00
BESSMCB2A A & T. \$344.00 \$310.00

SYSTEM SUPPORT 1 - GODBOUT

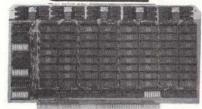
Serial port (software prog baud), 4K EPROM OR RAM provision, 15 levels of interrupt, real time clock,

PART NO.	optional math p	LIST PRICE	OUR PRICE
BE GBT162A	Assembled & Test		\$350.00
BE GBT162C	CSC	\$495.00	\$460.00
BE GBT8231	Math Chip	4,00.00	\$195.00
E GBT8232	Math Chip		\$195.00
E GBT162AM1	A&T with 8231 Ma	th Chin	\$555.00
E GBT162CM1	CSC with 8231 Ma	th Chin	\$655.00
E GBT162AM2	A&T with 8232 Ma	th Chin	\$555.00
E GBT162CM2	CSC with 8232 Ma	th Chin	\$655.00
	X CHANNEL BOAR		
I/O Mul	tiplexer, using 808	5A-2 CPU on	board
20020000	With 4K F		19/0000000
EGBT166A4	A&T	\$495.00	\$445.00
BEGBT166C4	CSC	\$595.00	\$535.00
	With 16K I		
BEGBT166A16	A & T	\$649.00	\$585.00
BEGBT166C16	CSC	\$749.00	\$675.00
	INTERFACER I - 0		
	Two Seria		
BEGBT133A	A&T	\$249.00	\$219.00
BEGBT133C	CSC	\$324.00	\$298.00
	INTERFACER II -		
Th	ree parallel, one s	erial I/O boar	d
BEGBT150A	A&T	\$249.00	\$219.00
BEGRT150C	CSC	\$324.00	\$289.00
	INTERFACER III -	COMPUPRO	
Eight	channel multi-use	e serial I/O bo	pard
BEGBT1748A	A & T	\$699.00	\$629.00
BEGBT1748C	CSC 200 hr. 8 Por		\$750.00
BEGBT1745A	A & T	\$599.00	\$559.00
BEGBT1745C	CSC 200 hr. 5 Por		\$629.00
	MULTI I/O - MORR	OW DESIGNS	4
	Three Serial, Tw		
EMDSMB3200		\$359.00	\$329.00
	TCHBOARD - MO		
	wo serial I/O, fou		13
	ne status port, on		0000.00
EMDSSB2411		\$299.00	\$269.00
	1/04 - SS		
	Two serial I/O, two	parallel I/O	G.,,,,,
ESSM104K	Kit		\$210.00
ESSM104A	A & T	\$290.00	\$260.00
	I/O 5 - S		
2 Seri	al, 3 Parallel inclu	ding 1 Centro	nics
ESSM1051	A 8 T	\$329.00	\$309.00
	1/0 8 - 5	SM	
	8 Port Serial I/O		
ABBIM223	A&T	\$550.00	\$495.00
r dominon	2710 4 PORT SE		4.00.00
e Full band			NOW DOM
4 Full hands	shaking RS232 po	ris and option	HIZK HUW
E CC\$271001		\$360.00	\$310.00
	19 2 SERIAL & 2 P		
	orts, 28 bit parallel		
E CC\$271901	A & T	\$360.00	\$325.00
F 0.09511901			
	<b>2720 4 PORT PAR</b>		
	2720 4 PORT PAR parallel ports and		ROM

### S-100 10 MHZ STATIC RAM

### **RAM 20 - 32K**

**ompuPro** 



#### 32K STATIC RAM - COMPUPRO

RAM 20 10 MHZ, 4K byte block disable, bank select

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
BEGBT164AA8	8K A&T	\$210.00	\$190.00
BEGBT164AC8	8K CSC	\$280.00	\$260.00
BEGBT164AA16	16K A&T	\$285.00	\$260.00
BEGBT164AC16	16K CSC	\$355.00	\$325.00
BEGBT164AA24	24K A&T	\$355.00	\$325.00
BEGBT164AC24	24K CSC	\$425.00	\$385.00
BEGBT164AA32	32K A&T	\$425.00	\$385.00
BEGBT164AC32	32K CSC	\$495.00	\$450.00

#### **CMOS STATIC RAM**

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of BYTE.

64K CMOS STATIC RAM - COMPUPRO RAM 17, 10 MHZ, 2 Watt, DMA Compatable

24 Bit Addressing BEGBT175A64 64K A&T BEGBT175C84 64K CSC 200hr. \$599.00 \$699.00 \$850.00 NEW! 32K x 16 BIT CMOS STATIC RAM - COMPUPRO 8 and/or 16 Bit

@18 RAM 16 10 MHZ, 32K x 16 or 64K x 8 IEEE/696 16 BIT 2 Watt, 24 Bit Addressing BE GBT180A 64K A&T \$650.00 \$599.00 64K CSC

NEW! 128E NMOS STATIC RAM - COMPUPRO RAM 21 15MHz, 128K X 8 OR 64K x 16 IEEE/696 8 or 16 Bit 1.2 Amps 24 Bit Addressing BEGBT190A \$1695.00 \$1610.00 BE GBT190C 128K CSC \$1895.00 \$1795.00

#### S-100 PROM

PBI PROM PROGRAMMER - SSM

Programs 2708 or 2716's, operates as a 4K/8K EPROM BOARD AS WELL

BE SSMPBIK \$179.00 Kit BE SSMPBIA \$220.00 **ECONOROM 2708 - COMPUPRO** 16K x 8 EPROM Board using 2708, Power on

jump to any 256 byte

BE GBT125A \$120.00 BE BBT125C CSC \$195.00 \$175.00 MB8A - SSM 1K/16K 2708 EPROM board, disable in 1K increments BESSMMBBAK KIL BESSMMBBAA A&T \$114.00

#### S-100 VIDEO BOARDS SPECTRUM - COMPUPRO

\$159.00

\$150.00

Color Graphics board with Parallel I/O BE GBT144A \$349.00 A & T \$399.00 \$399.00 BE BBT144C \$449.00 BE GBT20 Sublogic Universal \$35.00 Graphics Interpreter Software VB - 3 S.S.M.

80 x 25 or 50 character video display Memory Mapped, Parallel Keyboard port

BESSMVB3K24 80 x 24 Kit \$425.00 BESSMVB3A24 80 x 24 A&T \$499.00 \$440.00 80 x 50 Line Upgrade \$ 39.00 VB2-S.S.M.

I/O Mapped Video Board, with Parallel Keyboard port

64 x 16 BESSMVB2K \$199.00 BESSMVB2A \$269.00 \$229.00 VBBB - S.S.M Memory Mapped Video Board 64 x 16 character

display or 64 x 16 graphics display Kit

BESSMVB1A A&T \$242.00 \$220,00 S-100 CLOCK CALENDAR

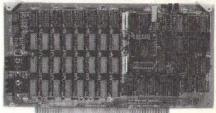
Assembled & Tested

BEOTCCCSA

As seen in March Kilobaud Magazine S-100 MOTHERBOARDS - COMPUPRO

П		Active termination, c	12-20 8101	
	BEGBT153A	A&T 6 slot, 2 lbs	\$140.00	\$126.0
	BEGBT153C	CSC 6 slot, 2 lbs.	\$190.00	\$175.0
	BEGBT154A	A&T 12 slot, 3 lbs.	\$175.00	\$155.0
	BEGBT154C	CSC 12 slot, 3 lbs.	\$240.00	\$220.0
ľ	BE GBT 155A	A&T 20 slot, 4 lbs.	\$265.00	\$235.0
	BE GTB155C	CSC 20 slot, 4 lbs.	\$340.00	\$310.0

#### S-100 DYNAMIC RAM



#### THE EXPANDABLE 1 PRIORITY 1 ELECTRONICS

THE EXPANDABLE 1" 64K Dynamic Ram board provides your S-100 system with 64K of reliable, highspeed dynamic RAM. Compatable with most of the major S-100 systems on the market, including those with front panels, it supports DMA operations and requires no Wait states with current microprocessors. User expandable from 16 to 64K . Supports DMA

 Designed to IEEE proposed S-100 bus standards ● 2 or 4 MHz operation • Operates with either an 8080 or Z-80 based S-100 system, providing processor-transparent refreshes with both 

Supports IMSAI-type front panels

Jumper-selectable Phantom input

Uses Popular 4116 RAMS . All ICs in sockets . Any 16K block can be made bank-independent • Fully buffered address and data lines • Fail-safe refresh circuitry for extended Wait states . Board configuration with reliable, easy-to-configure Berg Jumpers

RE PRIEVPIA 16K Assembled & Tested \$200 nn BE PRIEXP132 32K Assembled & Tested \$339.00 48K Assembled & Tested BE PRIEXPISA 64K Assembled & Tested \$409.00

#### S-100 DISK CONTROLLERS

2422A - CA. COMP. SYST. I/O Mapped, controls 8", single or double density A&T with CPM 2.2 8"

LIST PRICE

BECCS2422A \$475.00 DISK JOCKEY 2D - MORROW

Memory Mapped, controls 8", single or

double density, serial I/O A&T with CP/M 2.2 \$399.00 BE MDIDJ2208

#### S-100 DISK SUBSYSTEMS

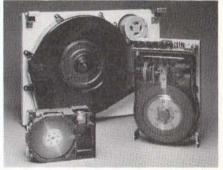
DJ2B DISCUS SINGLE SIDED MORROW

8" DBL Density drives with cabinet, power supply controller, with CP/M 2.2 and Microsoft Basic Single Drive System \$1095.00 \$950.00 Dual Drive System \$1875.00 \$1598.00

DJ2B DISCUS DOUBLE SIDED - MORROW

8" DBL Density/sided drives with cabinet Power supply controller, with CP/M 2.2 and Microsoft Basic Single Drive System \$1395.00 Dual Drive System \$2495.00 REMDSF2228 \$2050.00

#### S-100 HARD DISK - MORROW



5.25" 5MB, 8" 10 & 20MB, 14" 26MB formatted hard disk complete with cabinet, P.S., Controller,

CP/M 2.2 and Microsoft MBASIC 80 SALE PRICE LIST PRICE \$1995.00 BEMOSOMAMS. 5 MR \$2495.00 BEMDSM10S 10 MB \$2950.00 \$3695.00 REMOSM20S 20 MB \$4795.00 \$3825.00 BEMDSM26S 26 MB \$4495.00 \$3495.00



OUTPERFORMS MONITORS OF TWICE THE PRICE! USI has the competition buckling at their knees!

You can have a professional performing Video Monitor for a traction of the cost! The USI EV2131N is a 12" Green, high resolution data display compatable with 80 x 24 computer formats

REUSIEV2131N 24 lbs. \$149.00

ELECTIONICS

#### COMPUPRO DMA DISK 1 WITH FREE CP/M 2.2 **SALE \$450.00**



Priority 1 Electronics is pleased to offer the COMPU-PRO DISK 1 High Performance Disk Controller at our regular low price with CP/M 2.2 and BIOS at no additional cost. That's a savings of \$220.00 of the manufacturer's list price.

- Third generation INTEL 8272/NEC 765A LSI floppy disk controller.
- High speed cycle stealing DMA interface for processor independent data transfer between system memory and flexible disk.
- Handles up to four 8 or 5.25 inch floppy disk drives Single or double density/single or double sided
- capability.

  Supports IBM 3740 soft sectored formats.
- 24 bit DMA addressing with data transfer across 64K boundaries for data transfer throughout the 16Mbyte memory map.

IPART NO.	DESCRIPTION	LIST PRICE	
BEPDB171ACPM	A&T w/CP/M 2.2 & BIOS	\$670.00	\$450.00
BEGBT171C	CSC	\$595.00	\$555.00
BE GBTCPM80*	CP/M 2.2 for Z80/8085	with	\$175.00
	manuals & BIOS 8" S/D	) disk	

Oasis 8 bit single user 8" S/D disk **BEGBTOASSS** BEGRTDASEM Oasis 8 bit multiuser, 8" S/D disk

#### S-100 SYSTEMS SUPERSIXTEEN — COMPUPRO

HERE IS WHAT EACH PACKAGE INCLUDES: BE 6811612A 6 MHz 8085/8088 Dual Processor Board

BE SBT171A High Speed DMA Disk Controller

BE 68T162A System Support 1 Multi-Function Board BE 68T133A Interfacer 1 Dual Serial I/O

BE 128K 10MHz Low Power Static Ram BE GBTCP/M 85 16 Bit Operating System Ready to Load & Go Cables and Documentation Three interfacer cables one disk I/O cable, complete documentator for all hardware, and manuals for both CP/M operating systems.

Compu Pre's famous 1 Year limited warranty.

Now to the best part of all. If purchased separately, these quality components would list for \$4,344.00. BUT SuperSixteen's lew package price is an amazing \$3,495.00. You save \$849.00(/For boards qualified under the Certified System Component high-reliability program - with extended 2 year warranty, 200 hour burn-in and 6/8 MHz processors - add \$600.00 to Sh. Wt. 15 lbs. the package price. RE PORGRESJ \$3495.00

BE PDBGBTSK

SuperSixteen A&T SuperSixteen CSC \$4095.00

### PRINTERS





\$99.00

#### MICROLINE -OKIDATA WITH FRICTION AND TRACTOR FEED

- 6x9 or 12 Matrix for Graphics Self Test
- 5,8.3, 10,16 Charactrs p/Inch Out of Paper Switch
   6 or 8 Lines per Inch Friction or Tractor Feed
- 6 or 8 Lines per Inch
   80 CPL@10 CPI for 82A
- •3" to 14" Top of Form 132 CPL@10 CPI for 83A (Switch Selectable)

 10 Different Character Sets
 LIST PRICE SALE PRICE DESCRIPTION BE OKIDAT82AT(26 lbs)8 80 CPL @ 10 CPI \$ 799.00 \$539.00 BE OKIDAT83AT (37 lbs) 132 CPL @ 10 CPI \$1195.00 \$750.00 \$159,00 BEOKISER2KBF 9600 baud with 2K Serial

Buffer upgrade with X-on Y-off BE OKIGRAPH High Resolution Graphics Prom CALL FOR THE NEW MICROLINE 84

MX80 - EPSON NEED WE SAY MORE?

\$450.00 \$725.00 BE EPHMX80 Tractor Feed 17 lbs \$645.00 BEEPNMXIO0 132 Col. Tractor Feed 24 lbs
PRINTER INTERFACES - MICROBYTE

R\$232 Serial Conversion for MX80 REMRSSEIT

A&T Apple Centronics 8 bit parallel interface for Centronics, Epson & OKIDATA printers
BE MBSAEL A & T
BE MBSAEC Cable for above

\$55.00 Printer interfaces & cables sold only with printer purchase

#### S-100 MAINFRAMES



#### S-100 MICROFRAME - TEI

110V 60HZ CVT Mainframes, the best money can buy! 12 Slot ±8V 17A±16V @ 2A

22 Slot ±8V @ 30A± 16V @ 4A

Esselement .			OUR	PRICE
PART NO.		LIST PRICE	1-9	10-24
BETEIMCS 112	12 Slot Desk	\$685.00	\$815.00	\$570.00
BETEIMCS 122	22 Slot Desk	\$825.00	\$760.00	\$705.00
BETEIRM 12	12 Slot Rackmount	\$725.00	\$720.00	\$619.00
BETEIRM 22	22 Slot Rackmount	\$875.00	\$850.00	\$750.00
Shipping	Weight: On 12 SI	ot Mainfr	ame 45	lbs.
	On 22 Slot Mainfra	ames 55 l	bs.	

#### **TEI S-100 FRAMES** 3 - 5" DISK CUTOUTS

±8V @ 17±16V @ 1.2A, Internal Cables

1-9 BETEITF12 \$675.00 \$825.00 \$580.00 12 Slot Backmount \$795.00\$715.00 \$665.00 BETFIRF12 Shipping Weight: On 12 Slot Desk 40 lbs. On 12 Slot Rackmount 45 lbs.

#### **DUAL 8" DISK DRIVE CHASSIS - TEI**

For Shugart 800/801R or 850/851R with internal power cables provided

+24V @ 1.5A+5V @ 1.0A - 5V @ .25A

1-9 10-24 \$535.00\$485.00 \$455.00 \$720.00\$670.00 \$630.00 BETEBCFDO Desk Top BETEIRFDO Rack Mount



#### -100 MAINFRAME - COMPUPRO

110V 60HZ CVT Mainframe uses famous 20 slot

COMPUPRO Motherboard. 55 lbs.
BEGBTENC20RM 20 Slot Rack Mount

\$895.00 \$825.00 \$825.00 \$780.00 BE SBTENC20DK 20 Slot Desk Top

#### S-100 MAINFRAME - CCS

12-slot motherboard with removable termination card BE CC\$220001 Office Cream 35 lbs \$575.00 \$535.00 35 lbs \$575.00 \$535.00 Rlue BE CC\$220002

#### **SOFTWARE - MICROPRO**

All software is supplied on 8" Single Density IBM 3740 CP/M Compatable Diskettes WORDSTAR

Screen-Oriented, integrated word processing system specifically designed for non-technical personnel BE MPRWRDSTA1 \$495.00 \$300.00

MAIL MERGE WORD STAR OPTION

Powerful file merging tool
BE MPRMLMRGA1(Requires Word Star 2.1 or later)\$250.00 \$100.00

BE MITMILLIMBAI(Hequires Word Star 2.1 or later) \$250.00 \$100.00

SPELISTAR WORD STAR OPTION

One Step "Proofreader" with compressed 20,000 word dictionary and user-created supplemental dictionaries BEMPRSPLISTA (Requires Word Star 3.0 or later) \$250.00 \$150.00

SUPERSORT
Sophisticated program that will select and re-arrange variable length information from data files
BEMPRSPRSER1 \$250.00 \$150.00

CALC STAR

Sophisticated, easy-to-use, electronic spread sheet and financial planner \$295 \$295.00 \$200.00

DATA STAR
Office-Oriented Data Entry, retrival, and

updating system \$350.00

Turn to pages 12 and 13 for our Full Color, 2-Page Ad Announcing Our Fall 1982 **Engineering Selection Guide** 



Tandon TM-800 Thinline is exactly half the size of conventional 8" floppy disk drives

Exactly one-half the height of any other model.

Propietary, high-resolution, read-write heads patented by Tandon
D.C. only operation - no A.C. required Industry standard interface.

Three millisecond track-to-track access time Single Sided \$425.00 2 or more
Double Sided \$575.00 2 or more
Manual - not included with drive
80IR - SHUGART \$395.00 \$550.00 \$ 10.00 **BETHOTMSM** 

Single sided double density most popular 8" drive ESHUBOIR \$425.00 ea or 2 or more (16 lbs) for \$395.00 ea ESHUSABOIRM Manual for 80 IR drives \$10.0

### MITSUBISHI ELECTRIC



**Better Than** OUME! **Better Than** SHUGART!

8 Inch double-sided, double density

RE MITM289463 BE WITM289463M Sh. Wt. 16 lbs. Manual

\$550.00 \$10.00

\$325.00 ea.

\$449.00 ea.

ONE

2 or more \$525.00 each

54" DRIVES - TANDON BETNOTM1001 Single Sided, 250KB (5 lbs) \$249.00\* ea.

2 or More \$220.00 RETURTM 1002 Double Sided, 500KB

2 or More \$299.00 \$325.00 ea. Single Sided, 500KB

2 or More \$299.00 BETNOTM1004 2 or More \$420.00

RETNOTMSM Manual, not included with drive \$ 18.80

\*As used in the IBM P.C.

BETNOTH 1003

#### DISK CABINETS

• Desk or rack mountable • Internal power and data cables
• Drives pull out for easy service and maintenance
BEVISY100 Disk Drive Cabinet (43 lbs)

\$495.00 \$449.00

SINGLE 8" - Q.T.

Single 8" cabinet with power supply BESTCBBCS (22 lbs) \$249.00

DUAL S" - Q T

Dual 8' cabinet with power supply \$395.00 \$349.00

BE VIS 9801 BE VIS 9802

5" CABINETS - VISTA Single 5" with P.S. Dual 5" with P.S.

TERMINALS



VIEWPOINT - ADDS

Detachable keyboard, RS232 interface and auxiliary port, 80 x 24 display, tiltable screen BEADDYWPR Shipping Weight 30 lbs \$699.00 \$525.00

VT200 - VISUAL TECHNOLOGY THE MOST RELIABLE TERMINAL WE'VE EVER USED!

Detachable keyboard, RS232C or 20MA interface, 110 to 19200 baud, 12" non glare 80 x 24 display, RS232 Aux. port and composite video out. BEVSL200 Shipping Weight 55 lbs. \$995.00





\$200.00

Terms U.S. VISA, MC, BAC, Check, Money Order, U.S. Funds Only. CA residents add 6%Sales Tax. MINIMUM PREPAID ORDER \$15.00. Include MINIMUM SHIPPING & HANDLING of \$2.50 for the first 3 lbs. plus 25¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your phone number. Prices subject to change without notice. We will do our best to maintain prices through May, 1982. Credit Card orders will be charged appropriate freight. If you don't already have your Spring '82 Engineering Selection Guide, send \$1.00 for your copy, today. Sale prices are for prepaid orders only.

### 16K Memory

ALL MERCHANDISE 100% GUARANTEED!

8/15.95 4116-200ns

CALL US FOR VOLUME OUOTES

	E	PROMS	Each	8 pcs
1702	256 x 8	(1ns)	4.95	4.50
2708	1024 x 8	(450ns)	2.99	2.75
2758	1024 x 8	(5V) (450ns)	9.95	8.95
TMS2516	2048 x 8	(5V) (450ns)	6.95	5.95
2716	2048 x 8	(5V) (450ns)	5.50	4.95
2716-1	2048 x 8	(5V) (350ns)	9.00	8.50
TMS2716	2048 x 8	(450ns)	9.95	8.95
TMS2532	4096 x 8	(5V) (450ns)	12.95	11.95
2732	4096 x 8	(5V) (450ns) (20	Ons) (	CALL
2764	8192 x 8	(5V) (450ns)	(	CALL

2732 2764	4096 x 8 8192 x 8	(5V) (450ns) (20 (5V) (450ns)	)0ns)	CALL	
	DYN	AMIC RAMS		100 pcs	
4027 4116-120 4116-150 4116-200 4116-300 4164	4096 x 1 16,384 x 1 16,384 x 1 16,384 x 1 16,384 x 1 64,536 x 1	(250ns) (120ns) (150ns) (200ns) (300ns) (200ns)	2.50 8/29.95 8/18.95 8/15.95 8/14.95	2.00 CALL 1.95 1.80 1.75 CALL	
	STA	TIC RAMS		100 pcs	
2101 2102-1 21L02-4 21L02-2 2111 2112 2114 2114L-2 2114L-3 2114L-4 2147 TMS4044-4	256 x 4 1024 x 1 1024 x 1 1024 x 1 256 x 4 256 x 4 1024 x 4 1024 x 4 1024 x 4 4096 x 1	(450ns) (450ns) (LP) (450ns) (LP) (250ns) (450ns) (450ns) (450ns) (LP) (200ns) (LP) (300ns) (LP) (450ns) (55ns) (450ns)	1.95 .89 1.29 1.69 2.99 8/16.95 8/19.95 8/17.95 9.95 3.49	1.85 .85 1.15 1.55 2.49 2.79 1.95 2.35 2.25 2.10 CALL 3.25	
TMS4044-3 TMS40L44-2 TMM2016	4096 x 1 4096 x 1 2048 x 8	(300ns) (LP) (200ns) (200ns) (1	3.99 4.49	3.75 4.25 CALL	

#### LP = LOW POWER

74LS166

74LS168

74LS169

741 5170

74LS173

74LS174 74LS175

74LS181

74LS189

74LS190

741 S191

74LS192

74LS193

741.5194

741 5196

74LS197

74LS221 74LS240

74LS241

74LS242

74LS243

74LS244 74LS245

74LS247

741 5248

74LS249

74LS251

74LS253

74LS257

74LS258

74LS259

74LS260 74LS266

74LS273

741 5275

74LS279

741 5280

74LS283

74LS290

(200ns) (150ns) (120ns) CALL

1.75

1.75

.80

.95

.95

9.95

1.00

.85

95

85

.85

.99

1.85

ga

1.90

1.25

1.30

.85

.85

85

2.85

.65 .55

3.35

1 98

1.00

1.20

1.00

74LS293 74LS295

74LS298

741 5324

74LS352

74LS353

74LS363

74LS364

74LS365

74LS366

74LS367

74LS368

74LS373

741 5374

74LS378

74LS379

74LS385

74LS386

74LS390

7415393

74LS395

74LS399 74LS424

74LS447

741 \$490

74LS668

74LS669

74LS670

74LS674

74LS682

74LS683

74LS684

74LS685

74LS688

741 S689

81LS95

811 596

81LS97

81LS98

1.85

1.20

1.75

1.55

1.55

1.95

95

.95

70

70

.99

1.75

1.45

1.18

1.90

1.90

1.65

1.70

1.95

1.69

1.89

2.20

9.65

3.20

2.40

2.40

2.40

1.69

1 69

1.69

1.69

.65

2048 x 8

741 585

74LS86

741 590

74LS91

74LS92

74LS93

74LS95

741.596

74LS107

74LS109

74LS112

74LS113

741 5114

741 5123

74LS124

74LS125

74LS126

74LS132

74LS136

74LS137

74LS138

74LS139

74LS145

74LS147

74LS148

74LS151

74LS153

74LS154 74LS155

74LS156

74LS157

74LS158

74LS160

74LS161

74LS162

741 5163

74LS165

1.15

.40

.89

.70

.95

.40 .40 .45

.45

95

2.99

.95

.85

.75

.55

.75

1.20

2.49

.75 .75

2.35

1.15

.75

.75

.90

.95

CS	20 700 KH7	3.95
50	32.768 KHZ	3.95
220	1.0 MHZ	4.95
75	1.8432	4.95
95	2.0	3.95

1.8432	4.95
2.0	3.95
2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579545	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
6.5536	3.95
8.0	3.95
10.0	3.95
14.31818	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95

CRYSTALS

#### MISC.

3.95

32.0

AY5-2376	12.50
11C90	13.95
XR2206	4.95
3242	7.95
3480	9.00
MC4024	3.95
MC4044	4.50
7103	9.50
7106	9.95
7107	12.95
76477	3.95
8038	3.95
95H90	7.99
9602	1.50

### DISC CON-

TROLL	.ERS	
1771	24.95	
1791	36.95	
1793	44.95	
1797	54.95	
UPD765	39.95	
UARTS		

AY3-1014	6.95
AY5-1013	3.95
TR1602	4.95
IM6402	7.95

### INTERFACE

8T26	1.69	
8T28	2.49	
8T95	.99	
8T96	.99	
8T97	.99	
8T98	.99	
DM8131	2.95	
DS8836	1.29	
CLOCK		

### CIRCUITS

MM5369	3.95
MM5375	3.95
MSM5832	7.45
7207	7.50
7208	15.95

#### CONVERTERS

4.95
4.95
4.95

### MAY SPECIALS

#### 16K APPLE\* RAM CARD

- Upgrade your 48K Apple II to full
- Fully software and hardware compatible with Apple language card and microsoft Z80 card.
- Eliminates the need for Applesoft or Integer Basic ROM card when used in conjunction with DOS 3.3.
- Allows you to run Apple Fortran or
- Available as bare board, kit, or completed and tested board. BARE BOARD ..... \$ 40.00

		89.95
	IBLED &	109.95
6883	SAM	24.95
RS232	FEMALE	3.49
RS232	RIGHT ANGLE	
	FEMALE	4.95
RS232	MALE	2.99
RS232	HOOD	.99

Specials	end Ma	y 31,	1982.	Please	state
"May Sp	ecials"	whe	n orde	ring.	

7					
	6	5	0	2	

	-
6502	6.95
6502-A	12.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	9.95
6532	14.95
6551	11.85

#### Z80

Z80-CPU Z80A-CPU Z80A-P10 Z80A-P10 Z80-CTC Z80A-CTC Z80-DART Z80A-DMA Z80A-DMA Z80A-DMA Z80A-S10/0 Z80A-S10/1 Z80A-S10/1 Z80A-S10/2 Z80A-S10/2 Z80A-S10/2 Z80A-S10/2	8.95 6.00 6.50 5.95 8.65 15.25 17.50 23.95 23.95 23.95 23.95 23.95 23.95 23.95 23.95
Z80A-S10/9	22.95
Z80B-CPU Z80B-CTC Z80B-P10	
Z8671 Z6132	39.95 34.95

#### **CMOS**

			CIV	103			
74C00	.35	74C374	2.75	4019	.45	4098	2.49
74C02	.35	74C901	.80	4020	.95	4099	1.95
74C04	.35	74C902	.85	4021	.95	14409	12.95
74C08	.35	74C903	.85	4022	1.15	14410	12.95
74C10	.35	74C905	10.95	4023	.35	14411	11.95
74C14	1.50	74C906	.95	4024	.75	14412	12.95
74C20	.35	74C907	1.00	4025	.35	14419	4.95
74C30	.35	74C908	2.00	4026	1.65	4502	.95
74C32	.50	74C909	2.75	4027	.65	4503	.65
74C42	1.75	74C910	9.95	4028	.80	4508	1.95
74C48	2.10	74C911	10.00	4029	.95	4510	.95
74C73	.65	74C912	10.00	4030	.45	4511	.95
74C74	.85	74C914	1.95	4034	2.95	4512	.95
74C76	.80	74C915	2.00	4035	.85	4514	1.25
74C83	1.95	74C918	2.75	4040	.95	4515	2.25
74C85	1.95	74C920	17.95	4041	1.25	4516	1.55
74C86	.95	74C921	15.95	4042	.75	4518	1.25
74C89	4.50	740922	5.95	4043	.85	4519	1.25
74C90	1.75	74C923	5.95	4044	.85	4520	1.25
74C93	1.75	74C925	6.75	4046	.95	4522	1.25
74C95	1.75	74C926	7.95	4047	.95	4526	1.25
74C107	1.00	74C927	7.95	4049	.55	4527	1.95
74C150	5.75	74C928	7.95	4050	.55	4528	1.25
74C151	2.25	74C929	19.95	4051	.95	4531	.95
74C154	3.25	74C930	19.95	4053	.95	4532	1.95
74C157	1.75	4000	.35	4060	1.45	4538	1.95
74C160	2.00	4001	.35	4066	.75	4539	1.95
74C161	2.00	4002	.25	4068	.40	4543	2.70
74C162	2.00	4006	.95	4069	.35	4555	.95
76C163	2.00	4007	.29	4070	.35	4556	.95
74C164	2.00	4008	.95	4071	.30	4581	1.95
74C165	2.00	4009	.45	4072	.30	4582	1.95
74C173	2.00	4010	.45	4073	.30	4584	.95
74C174	2.25	4011	.35	4075	.30	4585	95
74C175	2.25	4012	.25	4076	.95	4702	12.95
74C192	2.25	4013	.45	4078	.30	4724	1.50
74C193	2.25	4014	.95	4081	.30	80C07	.95
74C195	2.25	4015	.95	4082	.30	80C95	.85
74C200	5.75	4016	.45	4085	.95	80C96	.95
74C221	2.25	4017	1.15	4086	.95	80C97	.95
74C373	2.75	4018	.95	4093	.95	80C98	1.20

HOURS: Mon. - Fri., 9 to 5; Sat., 11 to 3



JDR MICRODEVICES, INC. 1224 So. Bascom Ave. San Jose, CA 95128 800-538-5000 • 800-662-6279 (CA) (408) 995-5430 • Telex 171-110

#### VISIT OUR RETAIL STORE!

TERMS: For shipping include \$2.00 for UPS ground, \$3.00 for UPS Blue Label air. \$10.00 minimum order. Bay Area residents add 6½ % sales tax. California residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

HM6116

74LS00

74LS01

741 502

74LS03

74LS04

74LS05

74LS08

741 510

74LS11

74LS12 74LS13

74LS14

741 515

74LS20

74LS21

74LS22

74LS26 74LS27

74LS28

74LS30

74LS32

741 533

74LS37

74LS38

741 540

74LS42

741 547

74LS48

74LS49

74LS51

74LS54

74LS55

74LS63

74LS73

74LS74

74LS75

741 576

74LS78

74LS83

74LS00 SERIES

.25

25

.25

.35

.25

.35

35

45

1.00

35

.35

.35

.35

25

55

.55

.35

35

.55

.75

.75

.75

.25

35

.40

40

1.25

### 2716 EPROMS 450NS (5V)

ALL MERCHANDISE 100% GUARANTEED!

8/4.95 ea

CALL US FOR VOLUME QUOTES

#### 8000

8035	16.95
8039	19.95
8080A	3.95
8085	12.95
8085A-2	16.95
8086	99.95
8088	39.95
8155	11.95
8156	11.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	44.95

#### 6800

6800	5.70
6802	10.95
6808	9.95
6809	24.95
6809E	29.95
6810	4.60
6820	4.95
6821	4.95
6828	14.95
6834	16.95
6840	14.95
6843	42.95
6844	44.95
6845	16.95
6847	15.95
6850	4.75
6852	5.75
6860	10.95
6862	11.95
6875	6.95
6880	2.95
68B00	10.95
68B21	12.95

68B50

12.95

Jumbo Red

Jumbo Green

MAN72 .3'CA

Jumbo Yellow

5082-7760 .43°CC MAN74 .3°CC

**LEDS** 

8200		
8202	45.00	
8205	3.50	
8212	1.85	
8214	3.85	
8216	1.80	
8224	2.50	
8226	1.80	
8228	4.90	
8237	19.95	
8238	4.95	
8239	4.85	
8243	4.45	
8250	14.95	
8251	4.75	
8253	9.25	
8253-5	9.85	
8255	4.75	
8255-5	5.25	
8257	8.75	
8259	6.90	
8272	39.95	

29 95

9.50

10.50

6.65

6.65 5.70

6.50 25.00

8275

8279

8282

8283

8284

8286 8287

8288

10/1.00

6/1 00

6/1.00

79

99

8279-5

### TV

CIRCU	IITS
MC1330	1.89
MC1350	1.29
MC1358	1.79
LM380	1.29
LM386	1.50
LM565	.99
LM741	.29
LM1310	2.90
LM1800	2.99
LM1889	2.49

#### **EPROM ERASERS**

PE-14	78.50
PE-14T (with timer)	108.50
PE-24T (with timer)	154.50

ALL ARE HIGH QUALITY UNITS ENCLOSED IN A BLACK ANODIZED ALUMINUM ENCLOSURE

800-538-5000

CALL JDR BEFORE YOU BUY! WE WILL BEAT ANY COMPETITORS' PRICES

#### **VOLTAGE REG's**

7805T	.79	7905T	.89
7808T 7812T	.99	7912T 7915T	.89
	.79		1.19
7815,T 7824T	.99	7924T	1.19
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39	79LO5	.79
78LO5	.69	79L12	.79
78L12	.69	79L15	.79
78L15	.69		
		LM317K	3.95
LM309K	1.49	LM323K	4.95
LM317T	1.95	LM337K	3.95

#### LINEAR LM301V

7400

7401

7402

7403

7404

7405

7406

7407

7408

7409

7410

7411

7412

7414

7416

7417

7420

7421

7422

7423

7425

7426

7427

7428

7430

7432

7433

7437

7438

7440

7442 7443

7444

7445

7446

7447

7448

7450

FIAI 20 I A	-04
LM308V	.98
LM309K	1.49
LM311	.64
LM317T	1.95
LM317K	3.95
LM318	1.49
LM323K	4.95
LM324	.59
LM337K	3.95
LM339	.99
LM377	2.29
LM380	1.29
LM386V	1.50
LM555V	.39
LM556	.69
LM565	.99
LM566V	1.49
LM567V	1.29
LM723	.49
LM733	.98
LM741V	.29
LM747	.79
LM748V	.59
LM1310	2.90
MC1330V	1.89
MC1350V	1.29
MC1358	1.79
LM1414	1.59
LM1458V	,69
LM1488	.99
LM1489	.99
LM1800	2.99
LM1889	2.49
LM3900	.59
LM3909V	.98
LM3914	3.95
LM3915	3.95
LM3916	3.95
75451V	.39
75452V	.39
75453V	.39

#### \$69.00 APPLE\* FAN

- EXTRA PLUG-IN CARDS CAN CAUSE YOUR APPLE TO OVERHEAT
- ULTRA-QUIET APPLE FAN DRAWS COOL AIR THROUGH YOUR COMPUTER
- **ELIMINATES DOWN TIME**
- SAVES REPAIR CHARGES **INCREASES RELIABILITY**
- CLIPS ON NO HOLES OR
- COLOR MATCHES APPLE
- LONG LIFE, LOW NOISE MOTOR



\* APPLE IS A TRADEMARK OF APPLE COMPLITER INC.

#### **TRANSISTORS**

10/1.00	100/ 8.99
.25	50/10.99
.25	50/10.99
.79	10/ 6.99
10/1.00	100/ 8.99
10/1.00	100/ 8.99
1914)	25/ 1.00
DOMESTIC CO.	10/ 1.00
	.25 .25 .79 10/1.00

7451

7454

7460

7470

7472

7474

7475

7476 7480

7481

7482

7483

7485

7486

7489

7490

7492

7493

7494

7495

7496

7497

74100

74107

74109

74110

74111 74116

74120

74121

74122

74123

74125

74126

74128

.19

19

19

19

.22 .24 .19

.25 .30 .35 .55 .25 .25 .29 .29 .29 .29 .29 .45

.29 .45 .29 .29

.49

.69

.69

69

#### IC SOCKETS

1-99

100

		100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
16 pin ST 18 pin ST 20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	
28 pin ST	.40	.32
28 pin ST 40 pin ST	.49	.39
ST = SO		
8 pin WW	.59	.49
14 pin WW		.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW		1.28
24 pin WW	1.49	1.35
28 pin WW		
40 pin WW		1.80
10/10/ - 10		

#### CONNECTORS

RS232 MALE	3.25
RS232 FEMALE	3.75
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

#### DID SWITCHES

Dir Ottille	11110
4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

74186

74191 74192

74193

74194

74195

74196 74197

74198 74199

74246

74247

74248

74249

74251

74259

74265 74273 74276

74279

74283

74284

74285

74290

74293

74298

74351

74365

74366

74367

74368

74376

74390

74393

74425 74426

74490

18.50

1.15

.79

.79

85

.85 .79

1.35

1.35

1.35

1.85

1.95

2 25

1.95

1.25

2.00

3.75

.95

.75

85

.65 .65

.65

.65

2.20

1.75

3.15

2.55

.75

.75

7400 SERIES

74142

74143

74144

74145

74147

74148

74150

74151

74152

74153

74154

74155

74156

74157

74159 74160

74162

74163

74164 74165

74166

74170

74172 74173

74174

74175

74176

74177

74178

74179

74180

74181

74182

74184

74185

74167

2.95 2.95

2.95

.60

1 20

.65

1.40

.65

85

.85

.85

.85

2.95

.75

.89

.89

.75

1.15

1.75

2.25

.75

.75

.23

.35

.34

.49

.35

95

.50

.65

35

4.95

.35

.50

.49

.55

.70

2.75

1.00

.30

.55 1.55

1.20

.29

.45

.45

.45

SHUGART SA-400

- Raw drive for use in TRS-80, Atari, Apple and other computers\*.
- NEW in original carton. Includes test certification.
- LIMITED SUPPLY they won't last long at this price.

CALL FOR VOLUME QUOTE

\*Some computers require modification of board.

HOURS: Mon. - Fri., 9 to 5; Sat. 11 to 3



#### JDR MICRODEVICES, INC. 1224 S. Bascom Ave.

San Jose, CA 95128 800-538-5000 • 800-662-6279 (CA) (408) 995-5430 • Telex 171-110

### VISIT OUR RETAIL STORE!

TERMS: For shipping include \$2.00 for UPS Ground, \$3.00 for UPS Blue Label Air. \$10.00 minimum order. Bay Area residents add 61/2 % sales tax. California residents add 6% sales tax. We reserve the right to limit quantities and sub-stitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

apple computer

ACP \$1029.00 1099.00 1225.00 1775.00

\$ 169 00 199 00

3495.00 🖈 2895.00

COMPUTERS

Apple II 64K w/Z80 Softcard & Vision 80 Apple III 128K AVAILABLE IN STORE ONLY

APPLE HARDWARE

Apple Disk II w/interface
Apple Disk II w/interface
Apple Disk II w/o
Politype Card
EEEE-488 Interface
1 year ext. warranty
Parallel Printer Interface
Communications Card
Pacal Language System
High Speed Senal Interface
Appleant II ROM Card
Language Card
I'' Green word
I'' Core word
I'' Core of the Subsystem
Graphics Tablet

Microsoft Z80 Softcard C Microsoft 16K RAMcard C SSM AIO Serial/Parallel The Keyboard Company

Versacard 4 in 1 CCS Serial I/O Parallel I/O M & R Enterprises

ALS Smarterm
Corvus 5Mb Hard Disk
10Mb
20Mb
Apple 16K Upgrade Kit
Votrax Voice Box

APPLE SOFTWARE

APPLE SOFTW/
Visicalic
SuperCatic
SuperCatic
VisiTend/VisiPlot
VisiTend/VisiPlot
VisiTend
BPI General Ledger
Inventory
Microcounter
Violatio
Septilistan
Vis-80 CP/Microcounter
Vis-

Fortran 80 Cobol 80 PFS Filing System PFS Report

APPLE COMPATIBLE HARDWARE

How Joystick
Numeric Pad
HOMptus
HOM Writer
RAMPlus
CPS Multifunction
Expansion Chassis
Thunderclock
X-10 option
Pascal option

SUPERCALC

FLOPPY DISK DRIVES QUME DT/8 D/D D/S

OUME DT/8 D/D D/S
Tandom TM/100-1 5 1/4\* Disk Drive
MPI (15-1-5 L/4\* - 40 tracks
Shugari SA400-5 1/4\* - 35 tracks
Shugari SA400-5 1/4\* - 35 tracks
Shugari SA000-8 1/4\* - 35 tracks
Simmens Shugari Companitie Model FDD-120-8D
PERSCI Model 277 Dual
MPI (152-5 1/4\* - Dual
MANGO/SIEMEAS 2 Density Single Side.
MPI (150-00-1) Dualbe Side.
MPI (150-00-1) Track Density Single Side.
MPI (150-00-1) Dualbe Side.

MPI 92 Double Track Density Double Side, 160 Track

only \$199.00

Qume Only \$569.95

16K RAMCARD

VISTA COMPUTER

Vision 80 © 80x24 display card Vision 40 © 40 col enhancement Vision 20 © lower case ROM AB00 Double Density 8" Controllers MM9 9 voice music GBT5 IBM Regent/Apple I/O PDS PROM development TYPE AHEAD BUFFER

VISTA V-DRIVE

VISTA V 80

AINI DISK DRIVE V 80 Single drive, case, V 80 Dual drive, case,

DISKETTES **VERBATIM &** 

Maxell Diskettes Maxell Diskettes

100% CERTIFIED ERROR-FREE

25 TRACKE BOUBLE BERSITY SINGLE-SIBER 5'4

ROBOTIC ARM

Automation or Robotic Assembly
 Education in Robotic Priciples
 Artificial Intelligence
 Artificial Intelligence
 Computer At and Games
 S1695.00

Microbot Minimover-5
Completely Assembled w/Applications Manual \$1695.00
ARMBASIC Software For TRS-80 39.95
Application/Reference Manual 16.95

**USI Computer Products** VIDEO MONITOR

(Sanyo Look Alike)

Model Pi 19" Green \$159.95

VISTA V-DRIVE Model V-1000 8" lloppy disk enclosures with Qume Datatrak 8

APPLE COMPATIBLE DRIVES (MicroSci)

CABINET w/2 single-sided drives, ps&c w/2 double-sided drives, ps&c A800 Double density controlle

A2 series is plug-compatible Save \$300 on dual drive system

DEALER PRICING AVAILABLE

## TOLL FREE ORDER LINE



\$429.00

### PRINTERS

List \$195.00 ACP \$74.95

LIST \$299.00
199.00
199.00
29.95
595.00
499.00
195.00
195.00
195.00
195.00
49.95
335.00

Vision 80

\$299.00

NOW WITANDON

LIST ACP \$479.00 ★ \$389.00 100.00 89.00 449.00 365.00 599.00 480.00 100.00 79.00

\$29.95 \$29.95 \$29.95

			LIST	ACF	
	MX-80 Dot Matrix		\$645.00	★ \$429 DO	
٠	MX-80/FT		745 00	529.00	
_	MX-100		999.00	725 00	
	Apple I/O & cable		110.00	89 00	
	Graftrax option		95.00	89 00	
	IEEE I/O & cable		130.00	95 00	
	Serial I/O & cable		130.00	95 00	
	Serial w/2K & cable		175.00	149.00	
	Universal Graphics Utility		39 95	¥ 35.95	
	NEC				
	8023 Dot Matrix		795.00	649 00	
	DIABLO				
×	630 Daisywhees		2965.00	2295 00	
	Tractor		249 00	169.95	
	C. ITOH/VISTA				
¥	Starwriter/V300	25 cps	1895.00	1495.00	
		45 cps	2195.00	1795.00	
	8510	100 cps	749.00	¥ 675.00	
	ANADEX				
	9500/9501		1650.00	1350.00	
	QUME				
	9/45		3295 00	2995.00	
	ins				



TERMINALS		
TELEVIDEO	LIST	ACP
910 912C 920C 950C	\$ 699.00 950.00 995.00 1195.00	\$ 599 00 699 00 799 00 999 00
SOROC IQ120 IQ135 IQ140		699 00 899 00 1149 00

### MONITORS SANYO 9 B&W

**SANYO** 



IBM	COM	MPAT	IBL	ΕВ	OAR	DS
					_	

Novation Sa



MAX-OUT YOUR IBM PC

# 576K RAM CARD	
5K populated	\$1199.0
2K populated	1739.0
5K populated	1849.0
a 192K ADD-ON W/SUPERCALC	-
WOW! Superdeal @	799.0
That's for both	
Wire Wrap Board	69.0

### ATA/15000

### **NATARI**

ATARI COMPUTER		
	LIST	ACP
400 w/16K RAM	\$399.00	\$339.95
400 Basic Language Module	49.00	47.00
800 w/16K RAM	899.00	699.00
410 Prog. Recorder	90.00	80.00
825 Printer	799.95	699.00
830 Acoustic Modern	199.95	159.00
850 Interface Module	219.95	189.95
MTK 16K RAM	99.50	74.00
MTK 32K RAM	199.50	139.00
ATARI VisiCalc	200.00	160.00
ATARI Pac-Man	44 95	36.95

Atari 16K Atari 32K Vic 20 16K	\$ 99.50 199.00	ACP \$ 74.00 139.00 149.00
--------------------------------------	--------------------	-------------------------------------

#### XEROX 820

-	***	404 400			DETWAS	200
THEE	1100	BUS	NES	2.20	JE I WA	46
w/pur	chase	AVR	G/L	A/P	Payroll	Inventor
\$1100	00 V	ALLIE	40	estable		

×	820-1 820-2 CP/M SuperCalc	5 1/4" system 8" system	200.00 295.00	* 3195.00 169.95 239.95
	Word Processing		500.00	429.95
	1		1	



### HEWLETT PACKARD

### HEWLETT-PACKARD COMPUTERS

	LIST	ACP	
4P-87	\$2495.00	\$1895.00	
4P-85A	2750.00	2095.00	
IP-83	2395.00	1050.00	
4P-125	2750.00	2095.00	
12901M 5 1/4" Dual Floppy		1875.00	
135A 51/4" Floppy w/Winche	ster	4765.00	
1895 A 8" Dual Floppy		5135.00	
430A Protter		1375.00	
12907A 32K Module		249.00	
2908A 64K Module		379.00	
12909A 128K Module		675.00	
32900A CP/M w/64K		425.00	
CALCULATORS	Carlo Sal	100	
HP-41CV w/2.2K memory	NEW! 325.0	0 256.00	

KRAONA CLUM MADAW			460.00	
CALCULATORS	10	Sala	10 C	
HP-41CV w/2.2K memory	NEW	325.00	256.00	
HP-41C Calculator		250 00	189.95	
Memory Module for 41C			26.00	
Quad RAM		95.00	83 95	
Card Reader for 41C, CV		215.00	169 95	
Printer for 41C, CV		385.00	291.95	
Optical Wand for 41C, CV		125.00	99.95	
HP-11C Advanced Scientific	NEW!	135.00	149.95	
HP-12C Financial		150.00	129.95	
HP-34C Prog. Scientific		150.00	119.00	
HP-38C Prog. Business		150.00	119 00	
HP-97 Programmable Printer		750 00	595.00	
NOTE WE STOCK ACCESS	ORIES			
HPIL Interface Loop			\$119.95	

a complete computer system 82182A Time Module 75.00 54.95

TERMS MO. Cashier's Check, Bank Wire Personal checks allow 2 weeks for processing. Include Driver's License and credit card 's Visa. MC. AMEX. CB, add 'Shavivec charge, Add 3's shipping & Handling or \$2, whichever is greater. Add O'lds for foreign orders or US Farcel Post Include Telephone number. NO CODs. Prices suject to change without notice. Some items subject to prior sale: We reserve the right to substitute manufacturer, Retail prices may vary.

#### MOUNTAIN COMPUTER

375.00

CPS Multifunction Card

Sale \$169.95

**SAVE \$300** 

Apple Board Set Z80 Softcard (Microsoft) 16K Ramcard Vision 80 display card (Vista) ALL THREE ONLY \$679 save \$306

LIST

ACF \$395.00 \$289 00 195.00 169 00 395 00 299 00

#### ELPAC FD206 8'

Floppy Disk Power Supply Drives 2 Drives +24V @ 3A +5V @ 2.5A -5V @ 0.5A LIST ACP \$159.00 \$99.00

AMDEK

12" B&W Monitor (Super Value) \$895.00 ea

### 16K Apple<sup>™</sup> Ramcard



Full 1 year warranty

Astec RF Modulator

MOSTEK RAMS

PMI "Super Beta"

200,000 pieces in stock — priced to move. Same as MK4027 except 1mS

P/N 1082 Channel 3 or 4 P/N 4151 UHF Channel 33

refresh MK4015 4Kx1 RAM

for

COLOR

B/W

29¢.

\$6.95 8.95

 Expand Apple II 48K to 64K Compatible with Z-80 Softcard

Allows system to run with CP/M™, PASCAL,

DOS3.3. COBAL Visicalc. etc. Supplied with extra 16K RAM & has (2) LED's

#### 32K STATIC RAM



2 or 4 MHz Expandable Uses

16K 4 MHz Kit 16K 4 MHz A&T 32K 4 MHz Kit 32K 4 MHz A&T BARE BOARD \$159.95 \$199.95 289.05 • 339.00 BARE BOARD 39.95 Bare Bdw/all parts less mem. 99.95

#### BARE BOARDS

S-100 Sound Board 8080A CPU 32K Static RAM (2114) 8K EFROM (2708) 2708/2716 EPROM ACP Proto Board Vector 8800 Proto Vector 8803 11 slot MB ACP Extender with connector 13 Slot Mother Board (WMC) 9 Slot Mother Board (WMC) 9 Slot Mother Board (WMC) 9 Slot Mother Board (WMC) \$34.95 34.95 34.95 24.95 34.95 22.96 22.20 9 Slot Mother Bd(Expandable) Floppy PCB (8" SHUGART) S100 (AY5-8910) Sound Board Apple Sound Board

#### UV "EPROM" **ERASER**



Model IIVe-11F \$79.95

#### 16K Memory Expansion Kits for Apple/TRS-80

200/250nS 200/250nS Specify computer \$12.95 CALL FOR VOLUME PRICING

#### "D" SUB CONNECTORS



Unreal price, DB37 male, DB25 female. Gold PC mount with mounting holes. Mfg. AMP. Specify 25 or 37 pins.

BD37 \$2.50 DB25 \$1.95



**PRODUCTS** PRINTER \$19.95 ea.

#### 12 VOLT BUZZER/HORN 2" DIAMETER



ALL METAL 2/\$1.99

### **GE D43C3**



#### MICROPROCESSORS

		of the latest	O.L.C	20011	~
18001 18002	\$99.00 69.00	8008-1 2901	9.90		14.95 14.95
180 180A 1-8 (3850)	9.95 11.95 16.95	2901A 9900JL 6502	14.95 49.95 9.95	8039 8073N 8755	12.95 34.95 49.95
650 802	16.95	6502A IM6100	16.95	8748	49.95
080A 085	4.75 14.95	6800B	11.75 19.95	68000	49.95 129.95
		RAN	1S	CALLF	PRICIN

6116/2016 \$7.95 8264-64K 8.50 4116-2 1.99 5290 \$1.99 4.50 6.79 3.79 4116-2 1.99 4116-2 8/12.95 6508 6518 6561 6561 3.79 6604 3.99 6605 7.99 9130 8.99 9140 8.99 93415 6.99 93425 6.99 4.69 4044 21L02 21L02-4 2111 4050 4060 4.69 4.69 3.99 4096 4115 4200 4402 5280 3.25 2.29 6.99 64K only \$8.50

#### SUPPORT 68047

8156 9.95	8275 19.95	68488	19.95	
8202 29.95	8279 9.50	46505	22.95	
8205 2.69	6810 4.75	6520	6,95	
8212 2.75	6820 6.50	6522	9.95	
8214 4.95	6821 6.50	6530-X	24.95	
8216 2.75	6828 10.50	6532	17.95	
8224 2.95	6834 16.95	6551	19.95	
8226 2.95	6845 22.95	Z80-PIO	6.50	
8228 3.95	6847 27.95	Z80A-PIO	9.50	
8243 9.50	6850 5.25	Z80-CTC	6.50	
8250 14.95	6852 5.25	Z80A-CTC	9.50	
8251 6.50	6860 10.95	Z80-DMA	19.95	
8253 11.95	6862 10.95	Z80A-DMA	27,95	
B255 4.50	6875 5.95	Z80-SIO	24.95	
8257 9.50	6880 2.49	Z80A-SIO	29.95	

#### MOS PROMS

8038 Fund

LM566 VC0

AY51013 (5V, 12V) AY51014A/1612 (5-14V) AY51015A/1863 (5V) IM6402 IM6403

2708 (450nS) \$5.75 2708 (650nS) 5.25 1702A 5.75 MM5203AQ 14.50 MM5204Q 9.95

9.95

4.50

ı	2764 (8Kx8) TS	\$69.95	270
4	2732 (4Kx8) TS	12.95	270
ı	2716/2516; 5V		170
ı	(2Kx8) TS	7.95	MM
ı	TMS2716, 5V, 12V	17.95	MM
ı	2758, 5V, (450nS)	3.50	
ı	NAME OF TAXABLE PARTY.	Address of the Party of the Par	770
ı	11.5	I-TE(	

2513-001 (5V) Upper 2513-005 (5V) Lower

2513-ADM3 (5V) Lower 14.95 MCM66710 ASCII Shifted 12.95

MCM66740 Math Symbol 13.95

MCM66750 Alpha Control 13.45

INTERNALLY COMPENSATED P/N OP12GJ Voffset = 1.0 mV

LOW POWER

**AMPLIFIER** 

Ibias = 5.0mA Gain = 40V/mV \$1.95 (quantity limited)

#### **4K STATIC RAM** SELL-OFF 10/\$9.90

Same as TMS4044 but designed specifically for Z-80 based systems. This s a full-spec 4Kx1 RAM, 450nS Order P/N Zilog 6104-4 while supply lasts

Zilog Z8 CPU with TINY RASIC \$49.95 Debug prog.

Plus 6132 companion 29.95 quasi-static RAM

00

"BLINKER" LED's re spond to sound. Compl ready to wear. (2"x2"). Sold at Nieman red, yellow, green LED's

#### CONNECTORS

22/44 S/T, KIM 43/86 S/T, MOT 50/100 S-100 Connector W/W

50/100 S-100 Connector S/T



#### Full ASCII **Encoded Keyboards**

3.95



VP-606 Async serial output. Reg. \$99.00 ACP SALE ... \$69.95

## MCM66750Abba Commi 1344 1771-018 "A Mirropy 2455 1781 Dati Fropy 1975 1781 Dati Fropy 2455 1781 Dati Fropy 2455 1789 102 Dati Fropy 2455 1789 102 Dati Fropy 2455 1789 102 Dati Fropy 4475 1789 00. DS Fropy 4475 1789 00. DS Fropy 4475 1789 00. BS Fropy 4475 1789 00. BS Fropy 4475 1895 2145 Clock Generator 1895 2701 10 bit Blinsiny 220 2703 B bit 18 1350 2701 10 bit Blinsiny 250 2703 B bit 18 1350 2701 10 bit Blinsiny 1350 2701 10 bit Blinsiny 250 2701 10 bit Blins 2350 USRT 16718 Astros MC14411 4702 W01941 C0M5016 INS8250 AY5-2376 AY5-3600 MM5740AAC

### SOCKETS **LOW PROFILE** SOCKETS (TIN)

	1-24	25-49	50-10
8 pin LP	.16	.15	.14
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	28	.27
20 pin LP	.34	.32	.30
22 pin LP	.29	.27	.24
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
40 pin LP	.60	.59	.58

#### **3L WIREWRAP** SOCKETS (GOLD)



	1-24	25-49	50-10
8 pin WW	.55	.54	.49
10 pin WW (Tin)	.65	.63	.58
14 pin WW	.75	.73	.67
16 pin WW	.80	.77	.70
18 pin WW	.95	.90	.81
20 pin WW	1.15	1.08	.99
22 pin WW	1.45	1.35	1.23
24 pin WW	1.35	1.26	1.14
28 pin WW	1.60	1.53	1.38
40 pin WW	2.20	2.09	1.89

#### DIP SWITCHES

74874

74574 89 74586 .72 745112 .72 745113 .72 745114 .72

01111	0112
2 Position	\$ .99
4 Position	1.19
5 Position	1.29
6 Position	1.35

#### MUFFIN® FAN

LINEAR

2.95

1.89 3.25 29 9.88 1.49 1.25 1.76 1.36 1.39 1.25 5.95 6.95 1.75 1.25 1.25 1.25 1.25 1.25 1.25 1.25

1.49

.98 19.96 1.26 1.75 1.50 2.75 1.99 .29

.33 .19 .75 .39

78M06 78M.G

LM108AH

LM301CN LM304H

LM305H LM305H LM307CN LM308CN LM308CN LM309K LM31DCN LM312H LM317T LM318CN LM317T LM318CN LM320H-XX\* LM320H-XX\* LM3237K LM3237K LM3237K LM323N LM339N LM339N LM339N LM339N LM339N LM340H-XX\* LM340H-XX\* LM340H-XX\* LM340H-XX\*

LM344H

LM348N

M350H

LM372N

LM376N

LM377N

LM383T LM386N

LM387N LM390N NE531V/T

NE592N LM702H LM709N/H LM710N/H LM711N/H LM715N

LM723N/H LM733N/H

LM741CN/H

LM748N/H LM760CN

LM1310N MC1330

MC1350 MC1358

4500 \$ .39

LM741CN-14 M747N/H

M739N

LM380CN/N LM3B1N

M358CN LM360N

LM300H

LM1414N LM1458CN/N

1.50

.95 3.10 1.75 .99 2.50 2.95 2.19

MC1488N

LM1496N

LM1556N LM1820N

LM1850N

LM1899N LM2111N LM2901N LM2901N LM2991TN CA3013T CA3021T CA3021T CA3023T CA3023T CA3035T CA3039N CA3069N CA3060N CA3060N

CA3089N CA3089N CA3096N

CA3096N CA3097N CA3130T CA3140T CA3146N CA3160T CA3190N

CA3410N MC3423N MC3460N

MC3460N SG3524N CA3600N LM3900N LM3905N LM3905N LM3914N LM3915N LM3916N RC4131N RC4136N RC4151N RC4194TK RC4196TK

SN75451N

SN75452N

SN75453N SN75454N

SN75491N SN75492N

SN75493N

SN75494N

TL494CN TL496CP

74500

74S18E

748194

745196

745241

1.89 2.75 2.75 2.99

.98 3.75 3.95 3.75 2.95 1.10 3.70 4.95 5.40 1.25 1.50 .59 .35



The dependable, low cost, largest selling fan for commercial cooling applications.

74847

748473

745474

748475 9.95

748570

748571

748572

748573

(वंववंववंववंववं)

TITITITI

7 Position \$1,39

9 Position 10 Position

 106cfm free air delivery 4.68" sq. x 1.50" deep.
 Weight - 17 oz. SPECIAL PURCHASE

NEW \$9.50ea.

### SUPER IC CLOSEOUT SPECIALS

	B 5000 5 5				-		
ULN2003	2/\$1.99	2N6121	3/\$1.00	8080A CPU	2.95	5027 CRT	\$9.95
74LS668	3/1.99	SIG 2652	3.95	2102 RAM	.75	11C24	6.95
74LS377	2/1.99	74S287	1.95	4060 RAM	1.49	95H03	2.89
74LS241	2/1.99	2758 EPROM	2.95	8X300 CPU	14.95	MM5320	5.99
8259	6.95	74173/BT10	5/1.99	74S387	1.96	9131 RAM	1.99
6561 RAM	2.95	Z80A CPU	4.95	2708 EPROM	8/29.95		
LM733CN	3/1.99	6522	6.95	74LS93	3/1.00		
MC1414	3/1.99	6502 CPU	5.95	2114	8/14.50	8700 A/D	2/16.95
" CP/M tra	demark of Di	gital Research	. Apple tra	demark of Apple	Computer.		
6561 RAM LM733CN MC1414	2.95 3/1.99 3/1.99	Z80A CPU 6522 6502 CPU	4.95 6.95 5.95	2708 EPROM 74LS93 2114	8/29.95 3/1.00 8/14.50	9131 RAM EMM4402 1103 RAM 8700 A/D	1.99 1.99 3/1.50 2/16.95

TOLL FREE

800-854-8230 910-595-1565

Mail Order: P.O. Box 17329 Irvine, CA 92713

Retail: 1310B E. Edinger, Santa Ana CA 92705 (714) 558-8813

542 W. Trimble, San Jose, CA 95131 (408) 946-7010

		7400	
7400 S	.19	7475 \$ .38	74161 \$ .88
7401	22	7476 .34	74162 .89
7402	.22	7479 4.60	74163 .87
7403	.22	7480 .49	74164 .87
7404	.22	7482 .95	74165 .87
7405	.23	7483 .55	74166 1.20
7406	.35	7485 .65	74167 1.95
7407	.35	7486 35	74170 1.69
7408	.26	7489 1.75	74172 4.75
7409	23	7490 .39	74173 79
7410	.22	7491 .57	74174 89
7411	.29	7492 .45	74175 .85
7412	.29	7493 .45	74176 .75
7413	.39	7494 .69	74177 .75
7414	.59	7495 .65	74179 1.34
7416	.29	7496 .69	
7417	29	7497 2.90	74181 1.75
7420	22	74100 2.90	74182 .75
7421	35	74107 32	74184 2.25
7422	29	74109 .37	74185 2.25
7423	29	74116 1.95	74186 9.95
7425	29	74121 .29	74188 3.90
7426	.29	74122 .39	
7427	25	74123 59	
7429	45	74125 .39	
7430	23	74126 .44	
7432	29	74128 .59	
7437	.25	74132 .69	74195 .68
7438	29	74136 .75	
7439	29	74139 95	
7440	19	74141 .79	
7441	79	74142 2.95	
7442	.57	74143 2.95	
7443	95	74144 2.95	
7444	.95	74145 .62	74273 1.05
7445	.79	74147 1.95	
7448	79	74148 1.20	
7447	65	74150 1.09	
7448	.79	74151 .67	
7450	.19	74152 .67	74285 3.90
7450	19	74153 .67	74290 1.25
7453	.19	74153 .67	
7454	19	74155 78	
7459			
7460	25	74156 78 74157 69	
7470	29	74157 1.65	
7472	.29		
7473	34	74160 .88	
7474	.34		74490 1.90
		74LS00	
74LS00	\$ .26	74LS113\$ 43	3 74LS245\$2.20

	-	74LS	00		
74LS00\$	.26	74LS1131 74LS114	\$ .43	74LS245	\$2.20
74LS01	.28	74LS114	.43	74LS247	1.10
74LS02	.28	74LS122 74LS123	55	74LS248	1.10
74LS03	.28	74LS123	1.19	74LS249	1.19
4LS04	35	74LS124 74LS125	1,35	74LS251	1,40
4LS05	.28	74LS125	89	74LS253	1.40
41.500	.20	14F2150	.02	74L3257	.co
4LS09	,35	74LS132	.79	74LS258	.98
4LS10	.28	74LS136	.49	74LS259	2.95
74LS11	.39	74LS132 74LS138 74LS138 74LS139 74LS145 74LS155 74LS155 74LS155 74LS156 74LS156 74LS156	85	74LS260	.65
4LS12	.33	74LS139	85	74LS261	2.49
4LS13	.47	74LS145	1.25	74LS266	.59
4LS14	-85	74LS148	1.49	74L5273	1.75
4LS15	-33	74LS151	.79	74LS275	4.40
4LS20	.26	74LS153	.79	74L52/9	.59
4LS21	.33	74LS154	1.70	74LS283	.99
4LS22	.33	74LS155	1.19	74LS290	.99
4LS26	.33	74LS156	.99	74LS293	.99
4LS27	.33	74LS157 74LS158	,85	74LS295	1,10
4LS28	.33	74LS158	.75	74LS298	1.19
4LS30	.26	74LS160	1.05	74LS324	1.75
74LS32	.33	74LS158 74LS160 74LS161 74LS162 74LS163 74LS164 74LS165 74LS166	1.15	74LS347	1.95
74LS33	.55	74LS162	1.05	74LS348	1,95
4LS37	.45	74LS163	1.05	74LS352	1.19
74LS38	,39	74LS164	1.19	74LS353	1.19
4LS40	.26	74LS165	.89	74LS363	1.49
4LS42	-79	74LS166	2.48	74LS365	.69
74LS47	.79	74LS166 74LS168 74LS169	1.15	74LS366	.69
74LS48	.96	74LS169	1.15	74LS367	.69
74LS51	.26	74LS170 74LS173	1.99	74LS368	.69
74LS54	.29	74LS173	89	74LS373	1.89
74LS55	.29	74LS174 74LS175	.89	74LS374	1.89
74LS73	.45	74LS175	.89	74LS375	.69
74LS74	.42	74LS181 74LS190	2.20	74LS377	1.95
74LS75	.59	74LS190	1.15	74LS385	1.95
74LS76	.45	74LS191 74LS192	1.15	74LS386	.65
74LS78	.45	74LS192	.98	74LS390	1,95
74LS83A	.79	74LS193 74LS194	.98	74LS393	1.95
74LS85 1	1,19	74LS194	1.15	74LS395	1,70
74LS86	.45	74LS195 74LS196	.95	74LS399	2.35
74LS90	.57	74LS196	.89	74LS424	2.95
74LS92	.75	74LS197 74LS221	.89	74LS668	1.75
74LS93	.75	74LS221	1.15	74LS670	2.29
74LS95	.88	74LS240 74LS242 74LS243 74LS244	1.69	81LS95	1,69
74LS96	.98	74LS242	1.69	81LS96	1.69
74LS107	.45	74LS243	1.69	81LS97	1.69
74L\$109	,45	74LS244	1.49	81LS98	1.69
74LS112	.43		VO	LUME PRI	CINE

CMOS TOLL FREE

001 002 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 022 023 024	25 1.39 .45 .35 .25 .45 1.39 1.15 .59 .45 1.10 1.19 1.15 .29 .75 .25 .65	4037 4040 4041 4041 4042 4043 4046 4047 4050 4051 4053 4053 4056 4058 4060 4066 4060 4066 4060 4071 4071 4072 4073 4073	1.29 1.25 .85 .85 .85 .85 .85 .1.75 1.25 .99 .45 .69 1.10 1.10 3.95 2.95 .35 .49 .35 .35 .35	4511 4512 4515 4516 4518	2.25 12.95 12.95 12.95 12.95 4.95 3.99 1.65 8.95 .75 .95 3.75 1.19 1.39 2.75 1.45 1.39
022 023 024 025 027 028 029 030	1.15 29 .75 .25 .65 .85 1.29	4069 4070 4071 4072 4073 4075 4076 4077	.35 .49 .35 .35 .35 .35 .35 .35 .35	4511 4512 4515 4516 4518 4520 4555 4556	1.19 1.39 2.75 1.45 1.39 1.25 4.95
031 032 034 035	2.15	4078 4081 4082 4085	.35 .35	4566 80C95 80C97	1.50

TERMS: MO. Cashler's Check. Bank Wire. Personal checks allow 2 weeks for processing. Include Drivers Loense and credit card 8 vis M. MC. MMS. CR and 3% service charge. Add 38 shipping & handling or \$2 witchever's layers and the processing for the charge. Add 50 to foreign or 60 cm of the control of the control of the charge of the charg



15381 CHEMICAL LANE \* HUNTINGTON BEACH, CA 92649 \* (714) 891-2677 \*

#### **★ SPECIALS OF THE MONTH ★**



ONLY \$25.00



ONLY \$55.00

WOW! LOOK! Brand new fully encoded ASCII keyboards. Guaranteed to work. With all documentation. SUPER DEAL! 40 pin dual 100 cable. +5V @ 500MA Perfect for 8" or 5" drive power. Comes with Shugart type connectors but 5" type can be put on. These are overstock from our Horizontal Cabinet shown below.
+5V @ 4A ● +24V or +12V @ 3A ● −12V @ 1A

### BREAK THE COST BARRIER!

THIS OFFER ONLY GOOD THRU MAY 1982 NOW IS YOUR CHANCE TO GET THAT COMPUTER LOOK AT THESE FEATURES!

- 4MHZ Z-80 CPU with 2 Programmable Serial and 3 Parallel Ports
- 64K Dynamic Ram w/Extended Addressing to 1MB
- Floppy Disk Controller with WD1795. Runs 8" or 5" Floppys Error Free
- 30 Amp Power Supply with S-100 MOD 12 Slot Mother with Regulated Floppy Supplies as Shown Below
- Tan and Charcoal Sturdy Steel Cabinet with Space for 2 Floppy Drives at Left (8" or 5")

#### OPEN FRAME POWER SUPPLIES

	DISK PO	WER SUPP	LIES	
PRIAM-	SHUGART-	CENTURY-	-MICROP	OLIS
+5V @ 9A	-5V @ .8A	+24V @ 4.5A	US-384	89.00
SH	UGART - S	SIEMANS - I	MPI 5%"	
+5V @ .5A	+12V @ .9A		US-340	33.50
+5V @ 2A	+12V @ 4A		US-323	56.25
SH	IUGART -	SIEMANS -	CDC 8"	
+5V @ 1A	-5V@.5A	+24V @ 1.5A	US-205	52.50
+5V @ 2A	-5V@.5A	+24V @ 3A	US-206	69.00
+5V @ 3A	-5V @ .6A	+24V @ 5A	US-162	89.00
+5V @ 1.7A	-5V @ 1.5A	+24V @ 2A	US-272	69.00
+5V @ 2A	+12V @ .4A	-12V @ .4A	US-HTAA	37.50



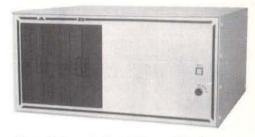
If you can beat these prices we will be truly amazed, OEM's at 500 lot pay more than this. Call or write for full spec, sheets.

#### COMING NEXT MONTH — HARD DISK!

S100-12

\$1750 Retail \$975.00

CP/M\* \$150 MP/M \$350 CABLE SET \$30



(Less Drives, Cables Pick-up Price)
\*CP/M is a Trademark of Digital Research

#### **★ DUAL DRIVE SUBSYSTEMS ★**







VERTICAL

MINI

- · Power Supply for 2 801/851 DT8 etc.
- 50 Pin Ribbon Cable, 36"
- AC Cord, Fuse, Internal Wiring and Connectors

w/2 801R Shugart	\$1045.00
w/2 851R Shugart	\$1395.00
w/2 QUME DT-8	\$1295.00
w/2 MPI B-51	\$ 675.00
w/2 MPI B-52	\$ 830.00
w/2 MPI B91	\$ 850.00
w/2 MPI B92	\$ 995.00
w/2 Empty 5"	\$ 87.00
w/2 Empty 8"	\$ 95.00

### ★ XOR

### S-100 MOD KIT \$199.00

For test or hobby applications complete S-100 12 Slot Sub-System power for up to 4 Floppy Disk Drives.

#### SPECIFICATIONS:

UNREGULATED REGULATED

12 Slots S-100 +5 at 5 Amps

• +8VDC at 30Amps +24 at 4 Amps

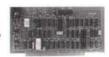
±16VDC at 6 Amps -5 at 1 Amp

XOR-CPU Z-80 4MHZ, Prom 2 S	Serial 3 Par \$255
XOR-DSK WD-1795 MINI and 8	\$275
XOR-64K Bank SW Memory up	to 1 Meg \$389
XOR-32K Static Ram (Kit)	\$199
XOR-MPM IO MPM Interface Ca	rd \$335
XOR-DTC Hard Disk and DTC T	ape \$225
XOR-SMS Hard Disk Controller	\$750

#### ★ MODEMS ★



Ask About Our Low Cost Modem Software



Hayes - Micro Modem	\$275.00
Hayes - Smart Modem	\$250.00
NOV DCAT 300 Baud Direct Con. Ans./Orig.	\$165.00
NOV AUTOCAT Auto/Ans./Orig. Direct Con.	\$235.00
NOV APPLECAT 300/1200 Baud Direct Con.	\$350.00
PMMI - MM103 300/600 Baud (S-100)	\$359.00

### ★ IBM AND APPLE ★





APPLE - 16K Ram Expansion Card, works with Microsoft Basic APPLE - Z-80 CPU Direct replacement for

\$99.50 \$149.50

Z-80 Softcard

IBM-PC Ram Expansion Card with 64K

(256K available

\$475.00

### California Computer Systems



Only - \$255.00

Only - \$330.00

- 2810 CPU
- 2422 Dsk Cont

- 2065C 64K
- Only \$510.00
- 2200A Mainframe
- Only \$450.00
- **CCS Apple Boards** 
  - Call for prices
- CCS 2200 System Tested and Assembled
  - Only \$1,695.00
- \* SPECIAL \* SPECIAL \* SPECIAL \*

#### CCS SYSTEM 2410 \*FEATURES\*

- **DMA Disk Controller**
- 2-Real Time Clocks
- 2-Serial/1-Parrell Port
- Hardware Vectored Interupts
- Supports C/PM, M/PM, OASIS
  - \*\*\*Comes with C/PM\*\*\* only-\$2200.00

CB2-CPU\$295.00
MB10A-16K\$295.00
MB64-64K\$845.00
I/05-2SER 3PAR\$329.00
I/O8-8SER\$550.00
Apple
A-I/O II\$225.00
A-SI/O

COMMUNICATIONS PACKAGES TRACENDI ......\$89.00 TRACEND II . . . . . . . . . . . . \$149.00

### commodore

computer systems **CALL FOR PRICES** 



SYSTEMS 200, 300, 400 CALL FOR PRICES



data systems

**CALL FOR PRICES** 



CALL FOR PRICES





11 EDISON DRIVE \* NEW LENOX \* ILLINOIS 60451 CALL TOLL FREE: 1-800-435-9357 \* MONDAY thru SATURDAY (ILLINOIS RESIDENTS CALL: 815-485-4002) \* 8:00 a.m. to 6:30 p.m.

TERMS: Prepayment - C.O.D. up to \$100.00 - M/C Visa \$5.00 Processing and Handling added to each order PLUS Shipping Charges. Please allow personal check to clear before shipment. 15% Restocking Charge for Non-Defective, Returned Merchandise.

### FEATURES! TERMINAL

- Feather Touch Capacitance Keyboard
- 60 Key Standard ASCII
- PLUS + Hex Keypad PLUS + 8 Special Function Keys
- PLUS + 20 Screen Editing Keys
- Half Intensity

#### COMPUTER

- 8 Slot S-100
- 64K Dynamic Ram
- 4MHZ Z-80
- Double Density Disk Controller
- Programmable Baud Rate
- Programmable Keyboard Set
- Serial Printer Port (150-19.2K)



CALL FOR QUOTE ON DIFFERENT DRIVE OPTIONS

WORDSTAR is a TM of Micropro Inc. - CP/M 2.2 is a TM of Digital Research Inc

### MONITORS

#### ZENITH VIDEO MONITOR-ZVM .....\$145.00

#### AMDEK MONITORS-

AMDEK Color 1 \$399.00	)
AMDEK Video 300 \$229.00	)
w/Green Screen	

#### DISK DRIVES

- Shugart 801's \$395.00
- Shugart 851's \$575.00
- Qume DT-8's \$540.00 Shugart 400's -\$255.00
- Tandom \$255.00
- 51/4

#### TERMINALS

- Adds Regent 20 \$570.00
- Televideo 910 \$575.00
- Televideo 912C \$665.00
- Televideo 925C \$740.00
- Televideo 950 \$950.00 Ampex Dialog 80-\$895.00
- Zenith Z19 \$745.00

### PRINTERS

AND WORDSTAR®

51/4" SS/DD Drives Only \$2700.00

WITH: 8" SS/DD Drives Only \$2850.00

- C-ITOH PROWRITER .....\$625.00
- C-ITOH Comet I 9 x 7 Dot Matrix . . . . . . . . \$450.00
- C-ITOH Comet II . . . . . . . \$810.00 132 Column Printer 9 x7 Dot Matrix
- MPI-88G . . . . . . . . . . . . . . \$725.00
- EPSON MX 100 . . . . . . . . . . . . CALL
- Anadex 9501 . . . . . . . . \$1,235.00
- **Graphic Printer**  OKIDATA
  - 82A . . . . . . . . . . . . . . . \$465.00
- Microline 80 . . . . . . . . . . \$329.00

#### WE HAVE NEC SPINWRITERS CALL FOR PRICES



Apple 8" Disk Controller Card

 ZVX4 Dual Density, Single & Double Sided - Auto Boot

.....\$395.00 Disk 2 + 2 Single Density Single or Dual Sided

.....\$300.00



#### UTIC MINI STEREO FM RECEIVER WITH HEADPHONES

For Joggers, Cyclists. and Skaters!

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3½" x 4½" x 1". Wt. 6 oz.

Model 1810 List Price \$89.95 ..... \$29.95 SPEAKERS



Size: 21/4" x 1/4"

Part # A0201

24" A0201 1.25 .99 214" Round — 8 Ohm .25 Watt (4" Leads)



Part# SF-25016 1.39 1.25 2½" Square — 16 Ohm .25 Watt (4 mount, holes) Large Ceramic Magnet Size: 2½" x 2½" x ¾"



### ☑ National Semiconductor

142	-1
STATIC RAMS	1
MM2114N-2 4K (200NS)\$2.49 each	
MM2114N-2L 4K (200NS) Low Power \$2.95 each a EACH \$19.95/lot) (100 EACH \$225.00/lot)	
MM2147N 4K (70NS)\$4.95 each	
B EACH \$34,95/lot) (100 EACH \$419,95/lot) MM6116P-4 16K (200NS)	
DYNAMIC RAMS	
MM4164N-20 64K (200NS)\$14.95 each	
MM5290N-2 16K (150NS) 4116 \$2.95 each B EACH \$19.95/lot) (100 EACH \$225.00/lot)	
MM5290N-4 16K (250NS) 4116 \$1.95 each	

#### **EPROM Erasing Lamp**



- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.

  Maintains constant exposure distance of one inch.
- Special conductive from liner eliminates static build-up.

- Special conductive foam liner eliminates statished built-in safety lock to prevent UV exposure.
  Compact only 7-5/8" x 2-7/8" x 2"
  Complete with holding tray for 4 chips.
  UVS-11EL Replacement Bulb

UVS-11E ..... \$79.95

### JOYSTICKS





JS-5K	5K Linear Taper Pots	
JS-100K	100K Linear Taper Pots	
JVC-40	40K (2) Video Controller in case	



#### MUFFIN® FAN

\$4.95

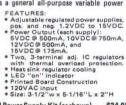
The dependable, low cost, largest selling fan for commercial cooling applications.

- fan for dommercia Guova, ys.

  105cm free air delivery,
  4.88" sq. x 1.50" depth, Weight 17 oz.
  4.80" sq. x 1.50" depth, Weight 17 oz.
  4.80" sq. x 1.50" depth, Weight 17 oz.
  5.00" depth,
- UL yellow card recognized & CSA approved
- 115V, 50/80Hz, 14 Watts, 105cfm Ultrasonically cleaned & tested. MU2A1 . . . . \$9.95 ea.

### JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.



JE215 Adj. Dual Power Supply Kit (as shown) . . \$24.95 (Picture not shown but similar in construction to above)
JE200 Reg. Power Supply Kit (6VDC, 1 amp) . . \$14.95
JE205 Adapter Brd. (to JE200) ±5.±9 & ±12V. \$12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. \$19.95

# COMPONENT TA ACQUISTTOM (CONTINUED)ON -Bill A/D Converter (B-Ch. Multi.) CN - Bill A/D Converter (B-Ch. Multi.) CN - Bill A/D Converter (B-Ch. Multi.) CN - Bill D/A CON, Micro. Comp. (6.29 CN - Boell D/A CONVERTER (6.29) E-Channel Multiplow B-Channel Multiplow B-Chann MICROPROCESSOR COMPONENTS

ı		/8080A SUPPORT DEVICES -		DATA A	CQUISITION (CONTINUED)-	
н	INS8080A+	CPU	4,95	ADC000CCN	8-Bit A/D Converter (8-Ch. Multi.)	
ı	DP8212	B-Bit Input/Output	3.25	ADC0817CCN	8-Bit A/D Converter (16-Ch. Multi.)	
1	DP8214	Priority Interrupt Control	5.95	-DACMOLCN	IP-Bit D/A Conv. Micro. Comp. (9.05%	a
1	DP8216	Bi-Directional Bus Oriver	3.49	DACHOSLON	IO-Bit D/A Conv. Micro. Comp. (0.20%	
ı	DP8224	Clock Generator/Driver	3.16	DACIMILLON	10-Bit D/A Converter (0.05% Lin.)	۰.
ı	DP8224	Bus Driver	3.49	DACIOZZILON	10-Bit D/A Converter (0.20% Lin.)	
1		System Controller/Bus Driver	4.95	DACIZZLON	12-Bit D/A Converter (0.20% Lin.)	
٠	DP8228		5,95	CD405IN	8-Channel Multiplexer	
١	IDP8238	System Controller			30K BAUD UART	
ı	IN58243	I/O Expander for 48 Series	9.95 16.95	AY-5-1013		
ı	INS8250	Asynchronous Comm. Element			RAM'S	-
ı	DP8251	Prog. Comm. I/O (USART)	6.95	1101	256×1 Static	
1	DP8253	Prog. Interval Timer	8,95	1303	1024×1 Dynamic	
ı	DP8255	Prog. Peripheral I/O (PPI)	5,95	2101 (8101)	256×4 Static	
١	DP8257	Prog. OMA Control	9.95	2102	1024×1 Static	
-1	DP8259	Prog. Interrupt Control	9,95	51 F05	1024×1 Static	
	DP8275	Prog. CRT Controller	39,95	2111 (8111)	256×4 Static	
4	DP8279	Prog. Keyboard/Display Interface	9.95	2112	256×4 Static MOS	
1	DP8303	System Timing Element	6.95	2114	1024×4 Static 450ns	
1	DP8304	5-Bit Bi-Directional Receiver	3.95	2114L	1024x4 Static 450ns Low Power	
١	DP8307	8-Bit Bi-Directional Receiver	3.95	2114-2	1024x4 Static 200ns	
-1	DP8366	8-Bit Bi-Directional Receiver	3.95	2114L-2	1094x4 Static 200ns Low Power	
-	DP8310	Octal Latched Peripheral Driver	5,25	745200	256×1 Static	
1	OP8311	Octal Latched Peripheral Driver	5.25		16K Dynamic 250ns (MM5290N-4)	
1	680	0/6800 SUPPORT DEVICES -	_	4164N-3	64K Dynamic 200ns	
-	MC6800	MPU	7.95	MM2167N	4096×1 Fast 70ns	
-1	MC6802CP	MPU with Clock and RAM	14,95	5101	256×4 Static	
-	MC6810API	128x6 Static RAM	4.95	MM5261	1024x1 Dynamic Fully Decoded	
. 1	MC6823	Peripheral Inter. Adapt (MC6820)	7.49	MM5262	2Kx1 Dynamic	
1	MC6828	Priority Interrupt Controller	17,95	MM5280/2107	4096x1 Dynamic	
-	MC6830LE	1024×3-Bit ROM (MC68A30-8)	14.95		16K Dynamic 150ns (UPD416C-2)	
Н	MC6850	Asynchronous Comm. Adapter	6.95	MM5298J-3A	8K Dyn, 200ns (lower to of MM\$290J)	
И	MC6852	Synchronous Serial Data Adapter	6.95	HM6116-4	16K (2Kx8) Static 200ns	
1	MC6860	0-600pps Digital MODEM	10.95	82525	64 Bit RAM (16x40C)	
۱	MC6862	2000ps Modulator	12.95	UPD414/MK4027	4K Dynamic M-pin	
1	MC6860A	Quad 3-State Bus. Trans. (MC8T25)	2.25	TMS4044-45NL	4K Static	
			E.63	TMS4946	1024×4 Static	
٦	——M	ICROPROCESSOR CHIPS	_	THURSDAY	PROMS/EPROMS	_
-1	Z85 (386C)	CPU (MK3890N) (2MHz)	11.95	1702A	2K UV Erasable PROM	
1	Z80A (780-1)	CPU (MK3880N-4) (4MHz)	13.95	2706	8K EPROM	
-1	COP1802	CPU	19.95	TMS2716	16K EPROM (-5V, +5V, +12V)	
-	2650	MPU	16.95		ISK EPROM (Single +5V)	
1	IDM2901ADC	CPU-4-Bit Silce (Com. Temp. Grade)	19.95	27321ntel Ti	32K EPROM (Single 15V)	
-	MCS6502	MPU w/Clock (65K Bytes Memory)	11.95	2752111tel 11	8K EPROM (450ns) (Single +5V)	
1	INS8035N-6	MPU-8-Bit (6MHz)	7,95	2764Q	64K EPROM (Hitachi HN462364)	
1	INS8039N-6	CPU-Sql. Chip 8-Bit (128 bytes RAM)	9.95	5203	2018 PROM	
-1	INS8040N-6	CPU (26 Bytes RAM)	24.95			
	INS8070N	CPU-64 Bytes RAM	24.95	12523(745386)	32x8 PROM (Open Collector)	
	IN 58073N	CPU w/Basic Micro Interpreter	29.95	825115	4096 Bipolar PROM	
	P9065	CPU	9.95	825123(745288) 825185	32x8 Tri-State Bipolar PROM BK PROM	
	TMS9900JL	MPU-16-Bit	39,95			
		30 Tune Musical MPU Chip	8.95	- Gver 30 Mio	re PROMS Listed in Our Catalog -	
	1173AN-1		0.00	2017/23/03	ROM'S	_
	CONTRACTOR OF THE PARTY OF THE	—SHIFT REGISTERS —	11500	2513(2140)	Character Generator (Upper Case)	
	MM500H	Dual 25-Bit Dynamic	.50	2513(3021)	Character Generator (Lower Case)	
d	MM503H	Dual 50-Bit Dynamic	.50		S READ ONLY MEMORIES -	-
	MMS06H	Dual 100-Bit Static	.50	MCM66710P	128×9×7 ASCII Shifted w/Greek	
	MM510H	Dual 64-Bit Accumulator	.50	MCM66740P	138x9x7 Math Symbol & Pictures	

12523 (745186) 12523 (745186) 125125 (745288) 125125 — Over 30 Mil 24.95 24.95 29.95 9.95 39.95 APU-M-Bit 1173AN-1 8.95 MC M66710F MC M66740F MC M66750F MM1402N

MPU-3-Bit 30 Tune Musical MPU Chip — SHIFT REGISTERS Dual 25-Bit Dynamic Dual 50-Bit Dynamic Dual 50-Bit Static Dual 64-Bit Accumulator 254-Bit Dynamic/Accumul 500-512-Bit Dynamic/Accumul 500-512-Bit Dynamic .50 .50 .50 .50 1.95 1.95 9.95 1.95 2.96 4.00 2.96 4.00 2.96 6.96 500/512-Bit Dynami Octal 80-Bit Octal 80-Bit 1694-Bit Dynamic How 23-Bit Static Dual 122-Bit Static 512-Bit Dynamic 1004-Bit Dynamic Dual 26-Bit Static Dual 26-Bit Static Dual 40-Bit Static Quag 40-Bit Static DATA ACQUISITION AF100-1CN AF121-1GJ AF122-1GJ

M-Z80 M-CDP1802 M-2650 DS0025CN DS0006CN INS1771N-1 INS2651N MM58176N COP402N COP402MN DATA ACQUISITION—
Universal Active Filter 2.5%
Touch Tone Low Band Filter
Touch Tone Liph Band Filter
Super Gain Op Amp
Constant Current Source
Temperature Transduce
Temperature Transduce
Temperature Transduce
Temp. Cemp. Pect. Ref. (Sppm/C)
4-841 A/O Convertor (I. E.B) 5.95 19.96 19.95 1,15 1.30 1.40 1.10 3.95 5.00 4.95 COPATION A V-5-9100 A V-5-9200 A V-5-9500 A V-5-9500 A V-5-2376 HD0165-5 MC922 74C923 MM53190N

PHONE/KEYBOARD CH Push Butten Telephone Dial Repertory Dialer CMOS Clock Generator Keyboard Encoder (88 Keys) Keyboard Encoder (16 Keys) Keyboard Encoder (16 Keys) Keyboard Encoder (20 Keys) Push Butten Pulse Dialer %/144-Key Serial Keyboard End EECO Rocker DIP Switch — "Mini-DipTM" 2400 Series
THE MOST UNIQUE DIP SWITCH AVAILABLE!

.79 .89 .99 .99 - 10/ 6.95 - 10/ 7.95 - 10/ 8.95 - 10/ 8.95 - 10/ 9.95 123456 1234567 12345678 123456789 0123456789

- MICROPROCESSOR MANUALS

SPECIAL FUNCTION

-TELEPHONE/KEYBOARD CHIPS

Out MOS Clock Driver (MZ)
Out MOS Clock Driver (MZ)
Floopy Disc Centroller
Floopy Disc Centroller
Microprocessor Real Time Clock
Microprocessor Compatible Clo

### **GRAB BAG SPECIALS**

2409-2 2408-3 2400-4 2400-ABC0 2400-5C



RESISTORS

Part No.	Description Prine	Part No.	Genetiction
08100	100 each Centres One (10pf - Janf)	G8116	200 each 1/4 watt resistor assortment
GRIDI	60 such Myter 4.00	GB117	200 each 1/2 west resistor assortment
GB102	60 such Electrolytics 4,60	GR118	30 es. Wire Wound 9.10.20W (.1-100 elem)
GB103	40 mich Tantalum (tutoular & rioped)	G8154	100 each 1 and 2 east resistor assurtment
GRITE	40 each Digued Micss (10pt-1000pt 6: 100-500V)	GB178	500 each 1/4, 1/2, 1 wett (marked/unmarked) resistors.
00.10	INTEGRATED CIRCUITS	00110	
68106	50 such TTS, Series - marked 54.00		SWITCHES
0.01-000	(7400, 74107, 74123, etc.)	GB120	25 auch Wirriature slide
GB109	30 such Linear - marked	GB122	20 es. Reed relays with call and insured - class tube
	(LM301, 307, 741, 308, etc.)	GB166	40 mat. toggle, rooker, qualification
GB148	30 each Exar — marked	GB179	30 each Dis Switches lister, positions!
	(XR320, 1310, 4136, etc.)		
08150	20 each Shift Registers - marked 4.60	0.0110	40 secti Territori Stripe
	(2510, 2018, 2532, 2533, etc.)	Canada	acidar and screw types (3 to 8 servinals)
GB157	50 each OTL Series - marketi	GRISO	150 each Spacers, standaff, imutators
CRISS	IDW930, 832, 936, 946, esc. I	40.40	(ment), review and plastic)
GETTE	6 pcs, Positive Vottage Regulators (TO-3 case) 4.25 (7805, 06, 12, 16, 16, 24, etc.) Linear marked	08141	200 each Washers and Spacers (notion and selton)
GRISS	6 p.cs. Negetive Vottage Regulators (TO-3 case)	GB142	90 ea. Chassis recurring feet trubber and plantic?
CRIM	17905, 05, 12, 15, 18, 24, etc.1 Linear marked	G8144	200 each Scieler lugs lernal()
08170	25 mch Americal 7418 TTL Series	08145	100 each (usp - crimp on isome insulated)
G8112	10 pcs. 78M Positive Voti, Rep. ITO 5 casel	G8146	100 each Grommers, cord strain reliefs
Same and	(78M00, R. 12, 16, 20, 24, etc.) Linear market	300000	and hole plugs
	LEDS - LAMPS - READOUTS	GB14X	500 early Hardware mix (nyts, livins, screwe, lygs)
		Obtob	48 Threaded matet and place's spacets (%-2" long)
GB110	100 each Assorted LEDs (colors & sizes)	G8167	200 pec, sheet matic and matel trapping screws
metts.		GB16B	200 pcs. angle birts, clip invalators, etc.
G8112	40 each NE 2 Neon Type Lange 3.05 20 ea: Multiple Readouts, calculators, eticks, 4.05	G8180	100 pcs. He eaupe and harness clips (3-6") 100 pcs. Resout/Siot Car gears, sharts, wheels, measure
08112	tirears, LEDS to Perapter - row, used and rejects	CHIND	
G8162	50 sech 7-Segment Displays 8:00	-	MISCELLANEOUS
menter.	(various colors and sites)	08123	30 each Pleas Sinks - metrical sizes
	POTENTIOMETERS	GB124	6 each assorted calculator-type keyboards
08113	30 sech Ministure Trimmers (100 ohm-1 Meg) \$4.00	GB128	50 each Opto-Indiators — (L-1 Series (untested)
	26 sech 3/8" equare single-turn PC Mount 1 Megr 34.00	08127	100 such Transitors - pleatic and power
GB134	Surfaceted 10 other to 500 atom) married	G8128	38 each Toroid Cores - Iron end tape
08138	26 each 3/8" square single-turn PC Mount 3.00	08129	50 each Photo Transistors (LFT) ,
99105	Substituted — TK to 50K) marked	88130	1 each Tape Drive - 5V motor with read/write
08136	26 sect 3/8" source single-ture PC Mount	022777	erase head and 2 cassette capes (no amplifier)
00130	(unitarial = 100% to 5 Mea) market	08131	30 each \$" shrink tuberg, seet, sizes and oblors
G0173	100 no. 3/III' as, single-turn fU Yest & Bost   5.00	08137	50 each Chokes, coils and inductors
DB124	25 ss. 's wart thurstwired single-turn (600 ohm-6 Meg) . 2.00		(motified-wire-adjustable) 2 each Speakers, 2's", 8 oftm, 1/6 watt
27.17	DIODES	G8188	Z each apeaters, Zh", 8 ofm, 1/6 mill
	ED each Assured Germanium \$2.00	Doise	300 each mixed resistors, department
08171		CRISC	Rinder, translators, chalce Printed Circuit Board
68107	0N34, INSB, IN270)	ustec	Printed Grount Board
	100 each Silcon (IN014/IN01488) 2.05 200 each merked, wymerked recollers & severs 2.05	68163	Contains 50-75 companients on each board 30 is. Sockets (Asst. IC and transistor)
GB104			

\$10.00 Minimum Order — U.S. Funds Only California Residents Add 6% Sales Tax Postage — Add 5% plus \$1.50 Insurance Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢ Send 88¢ Postage for your FREE 1982 JAMECO CATALOG Prices Subject to Change



1355 SHOREWAY ROAD, BELMONT, CA 94002 PHONE ORDERS WELCOME - (415) 592-8097

#### BOOKS

30001	National CMOS Data Book
30002	National Interface Data Book
	1704 pagesi DP, DS8000, DS3600, DS75000, etc.
30003	National Linear Data Book\$8.95
	(1376 pages) LM, LF, ADC, DAC, LH Series
30004	National Series 80 - Board Level Computer (224 pages) \$4.95
30005	National TTL Logic Data Book
	(624 pages) 7400, LS, L, H, S, and DM8000 Series
30006	Buy above (3) 30001,3,5 as a set\$19.95/iot
30009 010400	Intersil Data Book (1074 pages) 96.95 Intel Component Data Catalog 910.00 Full data sheets for Intel's products incl. memory devices,
	microproc., peripherals & indust./mil. products (1328 pages)
205610	
	Full data sheets, appl. notes for Intel peripheral device

#### **AC and DC Wall Transformers**



13.50 13.50 13.50

With Universal Plug and 9V Buttery Snap scrive voltages: 6,9,12VDC, arity selection (+f), six-foot from adapter to plugs — six-h line from adapter to battery p. 120V/60Hz, 300mA,

Part No.	Input	Output	Price
AC 250	117V/60Hz	12VAC 250mA	\$3.95
AC 500	117V/60Hz	12VAC 500mA	\$4.95
AC1000	117V/60Hz	12VAC 1 amp	\$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	\$3.95
DC 800	120V/60Hz	8VDC 400mA (batt, charger)	\$2.49
DC6912 (above)	120V/60Hz	6,9,12VDC 300mA	\$9.95
DV9200	117V/60Hz	9VDC 200mA	\$3.25
DC900	120V/60Hz	9VDC 500mA	\$3.95
DC1200	120V/60Hz	12VDC 300mA	\$3.95

#### CONNECTORS



DB25P DB25S	D-Subminiature Plug \$2.95 D-Subminiature Socket \$3.50
D20418-2	Screw Lock Hdwr, (2) DB25S/P 2/\$.99
DB51226	Cover for DB25P/S \$1.75
22/44SE	P.C. Edge (22/44 Pin) \$2.95
UG88/U	BNC Plug \$1.79
UG89/U	BNC Jack \$3.79
UG175/U	UHF Adapter \$ .49
SO239	UHF Panel Recp \$1.29
PL258	UHF Adapter \$1.60
PL259	UHF Plug \$1.60
UG260/U	BNC Plug \$1.79
UG1094/U	BNC Bulkhead Recp \$1.29
	TRS-80

16K Conversion Kit

Expand your 4K TRS-80 System to 16K Klt comes complete with:

\* 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram (\*ns)

\* Documentation for conversion
TRS-16K2 \*150ns 19.95
TRS-16K3 \*200ns 16.95
TRS-16K4 \*250ns 14.95



#### KEYBOARDS



**Datanectics 74-Key Keyboard** 

\$29.95 ea.



Micro Switch 69-Key Keyboard

Part No. KB69SD12-2 . . . . . . . \$19.95 ea.

**Boschert Multi-Voltage Power Supply** 



Price 82.50 2.00 4.00 2.00 4.00

83.00 6.00 10.00 9.95 \$3,00

2.00 2,00 2,00 2,00 2,00 2,00 3,00

5.00 2.00 2.00 3.00 3.00 9.95

\$3.00 9.00 2.00 3.00 4.00 4.00 9.00

4.00

1.00

2.00



FEATURES: Voltages\*: SVDC @ 25amps, 12VDC @ 4amps, & 24VDC @ 4amps, Reg. Load: +5V out ±1%, +12 & 24V out ±5% (20-100% load), Overvoit. & overcure, protection. 115 or 230VAC input. W1. 4 bis. Size, 4.95\* x 2.50\* x 15.00\* load overcoit. Size 4.75\* load overcoit. Size 5.75\* load ov

Part No. 200-3010 .\$69.95 each — MANY OTHERS AVAILABLE \* WRITE FOR INFORMATION

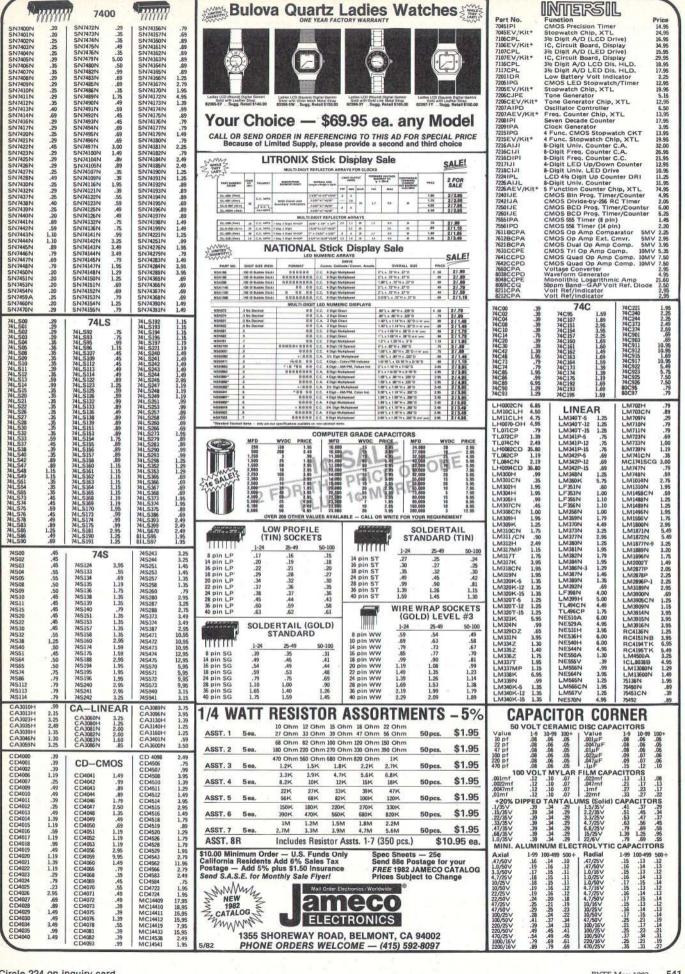
JE600 Hexadecimal **Encoder Kit** FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD



The JE600 Encoder Keyboard Kit provides two separate hexadeclimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts, Also included is a key entry strobe Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 18-pin IC connector. Only +5VDC required for operation. Size: 3%"H x 8%"W x 8%"D JE600/DTE-HK (After assembled JE600/DTE-HK as pictured above)...\$99.95

JE600 Kit PC Board & Computs. (no case) . . \$59.95 K19 19-Key Keyboard (Keyboard only) . . . . \$14.95 DTE-HK (case only - 31/2"Hx814"Wx874"D) \$44.95

Circle 224 on inquiry card.



### **Unclassified Ads**

FOR SALE: Synertek SYM-1 with 4 K monitor ROM and 1 K RAM. Excellent condition, with all manuals. \$150 plus postage. Robert Peristein, 142 Dumas Rd., Cherry Hill. NJ 08003, [609] 428-7282.

WANTED: Used computer-science books. Reasonably priced, in good condition for personal use—only one copy of a title wanted. Examples: programming languages, Knuth (Vol. 2), programming techniques, compiler design, applications, etc. M. Berman, Mathematics Dept., Room GT-113, Bronx Community College, Bronx, NY 10453.

FOR SALE: Programmer's Toolkit (3.0) for PET [8/16/32 K] and Commodore WP2 [16/32 K] and Temple of Apshai programs (32 K), Originally \$170. Asking \$70 for total package. MTU 8-bit DIA converter for PET. \$35 or best offer. Philip Chao, POB 387, Rochester, NY 14642, [716] 442-0903.

FOR SALE: 32 K Sorcerer with Vista V200 5-inch dual disks, S-100 expansion box, music DAC, and video CRT. CP/M, 280 assembler. BASIC and Development ROM PACs, and some Adventure games. Cost me \$2800; will sell for \$1600. Drop a card with quote and I'll call you. Gerald Owens, c/o S.M.C., Collegedale, TN 37315, [615] 396-3524 after 9 p.m.

FOR SALE: National Semiconductor Digitalker DT-1050 3-chip set. Never used, still in box. \$40. Jeffrey M. Craig, 3001 South King Dr. Apt. 912, Chicago, IL 60616.

FOR SALE: Jade double-density disk controller. S-100 bus compatible. Reads and writes single- or double-density. 5- or 8-inch, single- or double-sided. Uses on-board Z80A. Has serial printer port. \$200. Jim Burrett, 5-629 Rubdige St., Peterborough, Ontario, Canada. (705) 742-4831.

FOR SALE OR TRADE: Assembled and tested Disk-80 (BYTE, March 1981) substitute for RS expansion interface. Originally cost \$429.95. Two months old. For sale at \$250 or trade for database/business programs, printers, or hardware, Includes: 32 K RAM, disk controller for four drives, real-time clock, printer port, power supply, cable to TRS-80, case, and documentation. A. Keung, 761 Fieldstone Rd., Mississauga, Ontario, L5C 3K7 Canada, [416] 279-4613 after 6 p.m.

WANTED: Manuals covering the electronic portions of the Savin 900 Wordmaster and the Holmes Tycom KSR38 Selectric typewriter modification. I have the baseplate information available, if anyone needs it, but need maintenance manual or at least schematic for the digital electronics parts of both units, particularly the circuit boards of the Savin 900. Will pay for originals or copies. Please call collect. Bob Howard, 1234 South First Ave., Arcadia, CA 91006, (213) 446-3302.

FOR SALE: OSI C1P Challenger with 32 K memory, minidisk drive with DOS, APF 9-inch monitor, manuals, and repair manual. Barry Hammer, (608) 725-5114.

**WANTED:** The following back issues of Microsystems: 1-1, 1-3, 1-6, and 2-2. DJC, POB 4163, Spartanburg, SC 29303, [803] 583-6106.

FOR SALE: IEEE Computer, 35 issues from 9/71 to 2/78 [some missing]. Communications of the ACM, Vol. 23: #3, 5, 6, 9, 11 and Vol. 24: #1, 3, 73, 2/76 to 4/76. IEEE Spectrum. 89 issues from 2/68 to 2/76 [some missing]. Everything for \$150 or best offer. You pay postage. David Wolverton, 301 C Nubes, Irvine, CA 92715, [714] 752-7303.

FOR SALE: Tektronix 4051 graphics computer system. Includes 4662 digital plotter, 4924 tape drive, 4952 joystick, data-communications interface, Extended BASIC, editor, binary loader, ROM pack expander, manuals, and more. Software included: Mathematics Vol. 1 & 2, Stat Vol. 1-4, Mangmt Vol. 1 & 2, Plotter, and Graphics programs. More than 30 tapes. Can be used as stand-alone or terminal. Present price is over \$20,000, but will sell for \$5000. Ron Bremer, 19645 Southwest Wright St., Aloha, OR 97007, (503) 642-1048, 629-1859.

First Place Tle The February BOMB results ended in a tie for first place between Steve Ciarcia for "Build a Computerized Weather Station" and Steve Leibson for "The Input Output Primer, Part 1: What is I/O7" Each will receive \$100. Neal Atkins and Enrique Castro-Cid captured the second-place prize of \$50 for their description of "A Homebrew Graphics Digitizer." Our readers evidently appreciated the tax advice offered by Melvyn Feuerman and Melvyn Moller as their article "Tax Tips for Computer Owners" placed third. Our congratulations to these authors.

**UNCLASSIFIED POLICY:** Readers who are soliciting or giving advice, or who have equipment to buy, sell or swap should send in a clearly typed notice to that effect. To be considered for publication, an advertisement must be clearly noncommercial, typed double spaced on plain white paper, contain 75 words or less, and include complete name and address information.

These notices are free of charge and will be printed one time only on a space available basis. Notices can be accepted from individuals or bona fide computer users clubs only. We can engage in no correspondence on these and your confirmation of placement is appearance in an issue of BYTE.

Please note that it may take three or four months for an ad to appear in the magazine.

### **BOMB**

### **BYTE's Ongoing Monitor Box**

Article #	Page	Article	Author(s)
1	34	Everyone Can Know the Real Time	Ciarcia
2	60	Six Personal Computers from Japan	Kocher,
-	0.0		Keith
3	106	Japan Update	Haas
4	114	The Machines Behind the Machines	Lemmons
5	118	The Japanese Manufacturers, How	
-	7.7.00	Successful Will They Be?	Zipnick
6	140	Japan Maps Computer Domination	Manuel
7	148	The Atari Tutorial, Part 9: Even More	
•		Colorsi	Pitta,
		2010131	Winner
8	162	Ports of Entry and Soft Breezes for the	
		Color Computer and Model III	Barden
9	202	The Input/Output Primer, Part 4: The BCD	Dell'acti
	202	and Serial Interfaces	Leibson
10	224	Alien Typhoon	Latocha
11	226	Supercalc, Spelling Programs, Basic	Lucocna
14040	220	Compilers, and Home-Grown Accounting	Pournelle
12	246	PL/I for Microcomputers	Lehman
13	252	Apple II 80-Column Video Boards, Five	Lerman
13	232	Popular Units	Howland
14	266	More Apple 80-Column Boards	Williams
15	274	More Maze Building	Neldner
16	286	Colne Robotics Armdroid, The Small-Systems	recidine
10	200	Robot	Leininger
17	296	Super FORTH Isn't	Williams
18	318	TRS-80 BASIC Program Hang-ups: The	vv illidiris
10	310	Reasons and Some Solutions	Tesler
19	334	Anatomy and Development of a Batch-	163161
17	334	Processing System	Walters
20	426	CHEDIT: A Graphics-Character Editor	Sweet
21	446	Give Your Apple a Voice: A Speech	SWEEL
21	770	Development System Using the Radio Shack	
		Speech Synthesizer	Blanken-
		speech synthesizer	ship
22	465	Programming PERT in BASIC	Zimmer-
22	405	Programming PERT III BASIC	
			man, Conrad
23	479	CP/M, Your Time Has Come: A Real-Time	Cornad
23	7/7	Clock for the Most Popular Microcomputer	
		Operating System	Calaway,
		Operating system	Hill
			run.

### Reader Service

Inq	uiry No.	Page No.
1	47th STREET P A.S.T. RESEAR	HOTO 413
3	AB COMP.PRO	D. 514
4 5 6 7 8	AB COMPUTER ABM PRODUCT	S 452
6	ACTION COMP ADV.COMP.PR	UTER 73
8	ADV. EFFORT-	SAVER 506
9	ALF PRODUCT	GITAL CORP. 289 S, INC. 242
10	ALL ELECTRO	ING CORP 512
12	ALPHA BYTE C	JWD DDUUU 38 30
14	ALPS 444	0
15 16	ALSPA COMP.S	SYS. 263
17 18	AMDEK CORP.	23
19	AMER.SMALL I	BUSN.COMP 132 COMP, 188, 189
21	ANSWER CORI	COMP. 188, 189 P. 50
23	APPLEWARE,IN	
24 25		WARE TECH 387
26 310	ARBA 20 ARCHIVE 377	
27 28	ARRIX LOGIC S	SYS.INC. 522
29	ASAP COMPUTE ASAP COMPUT	T'L.RESRCH 512 R PROD 332, 333
30	ASHTON-TATE	341
32	ASPEN SFTW.0 ATARI 152, 153	O. 26 INET CORP. 504
33	ATLANTIC CAE	INET CORP. 504 INTROL SYS. 520
36	AVOCET 436 AXIOM CORP 3	
37	B&B ELECTR. 5	604
38	BASIC BOOKS 3	04
39 40	BAUSCH & LON	IB INSTR.SYS. 233 IB INSTR.SYS. 233
41	BAY TECHNICA BBI MAIL ORDI	ER 504
43	BEECH ENTER	PRISES 516
44 45	BIBLE RESEARCE	GR. 513 CH SYSTEMS 230
46	BIT 3 COMP.CO	DRP. 314 & DEVELP. 394
47 48	BMC INTL 119 BORLAND LIM	& DEVELP. 394
49 50	BORLAND LIM	TED 194 THE 326
51 52	BOTTOM LINE, BOTTOM LINE, BOWER-STEWA	THE 516 ART 508
53 54	BRIDGE COMP BUSINESS & P	UTER 238
55	<b>BUSINESS OPE</b>	RATING SYS 255
56 57	BYTE BOOKS 2 BYTE BOOKS 2	94
58 59	BYTE BOOKS 4	115
60	BYTE BOOKS 4	23
61	BYTE SUBSCRI BYTEK COMP.	BER 243
460	BYTEWRITER 4	61
62 63	CALIF DATA C CALIF. DIGITAL CALIF. DIGITAL	L 524, 525
64 65	CALIF. COMP.S'	rS. 107
66	CALIF.MICRO	COMP. 412 EVEL LABS 320
67	CDR SYSTEMS	508
68 69	CERMETEK 390	SOFTWARE 476
70 71	CHAPIN & ASSO CHECK-MATE	510
72 73	CHECKS-TO-GO	518 O 240
74 75	CHIPS & DALE	510 ISTRIES 409
76 77	CMC,INT'L. 211	, , , , , , , , , , , , , , , , , , , ,
79	CMC,INT'L. 211 CMC,INT'L. 287 COLONIAL DA	TA SERV. 116
80 453	COLONIAL DA COLUMBIA DA	
81 82	COLUMBIA DA COMMODORE	TA PROD. 89 BUSN.MACH. 383
83 84	COMMUNICAT	ION CABLE 520 ONS ELECTR. 509
451	COMPUCO BU	SN. SYS 485

Inq	uiry No.	Page No.
86	COMPULIN	IK CORP. 218
87	COMPUPR	O/GODBOUT 135 O/GODBOUT 136, 137
88	COMPUSE	RVF 476
89 448	COMPUSY	STEMS Inc. 504 MAGZN.&BOOKS 311 X CORP. 324
111	COMPUTO	RIAL 445
113 90	COMPUTE	W PROD.INC. 10, 11 R CHANNEL 437 R CLASSIFIEDS 520
452	COMP CO	MPNTS.UNLTD. 485
92 93	COMPUTE	R EXCHANGE 391 R FURN.& ACCSS. 134
94 95	COMPUTE	R HORIZON 464
96 97	COMPUTER	R IDEAS CORP. 516 R INNOVATIONS 429 I MAIL ORDER 424, 425
98 99	COMPUTE	R PLUS 506 RESOURCES 221
446 101	COMPUTE	R SHOPPER 460
102	COMP SHO	PPING CTR. 419 R SPCLTIES. 179 R TOOLBOX,INC. 506 R TOOLBOX,INC. 512 R WRHSE. 155
104	COMPUTER	R TOOLBOX,INC. 506
105	COMPUTER	WRHSE. 155
106	COMPUTER	RIST,THE 522 RS WHOLESALE 519
108	COMPUTER	RTIME INC. 510 RWARE 464
110	CONCORD	RWORLD INT'L. 319 COMP.PROD. 427 ENT CORP. 477
115	CONSUME	R COMP. 275
117	CONSUME	R COMP. 486 NC. 49
119 120	CONTEXT	MANGMNT.SYS. 24 MANGMNT.SYS. 25 MANGMNT.SYS. 25 MATA SYS. 111 DMP.UNLTD. 522
121 122	CORONA D	ATA SYS. 111 OMP.UNLTD. 522
123 126	CROMEMO	OCIL 1
126 127 128	CROMEMO	O 2 STEMS 518
	CABEHNEL	ICS INC 385 DUNT CTR 352
129	DATA-ED 28	IC. 310
130	DATA SOU	RCE SYS.CORP. 234
131 132	DATAMAC	COMP.SYS. 117
133 134	DAY STAR DEALIN' EL	H COMP.CORP. 83 TECHNOLOGY 85 .ECTR. 512
135 136	DELMART-D DELPHIC S	ECTR. 512 ELUX CHK.PRNTRS. 456 SYSTEMS 158
	DELTA PRO	YSTEMS 158 DDUCTS 146 DDUCTS 147 ENT SYSTEMS 514 UIP. CORP 336, 337
138 139 445	DEVELOPM DIGITAL EC	ENT SYSTEMS 514 UIP. CORP 336, 337
140	DIGITAL M	ARKETING 6 ICROSYSTEMS 253 ESEARCH COMP. 505 ESEARCH COMP. 521
	DIGITAL RI	ESEARCH COMP. 505
142 143	DISCOUNT DMA 444	SOFTWARE 348
144	DOW JONE	S 145 N BOOK BAZAAR 516
145 146	DRAKE MI	CRO SYS. 456 CONTROL CORP. 351
148 150	DYMARC II DYSAN CO	ND. 439 RP. 328, 329
462	FCONOMY	PERIPHERALS 518
151	EDMOND S	472 SCIENTIFIC CO. 441
153	ELECTROP	UBLISHING INC 473
154 156	ELECTRON	C SPCLISTS 472
202 157	ELECTRON	USS 526 C SPCLISTS 472 IIC SUPER-MART 522 IIC SYS.FURN 384 410 IPUTING 207 3 TECH.CONSLT. 431 L RESRCH GRP. 454 P 510 P,CORP. 139
158 159	ELEK-TEK ELLIS CON	410 IPUTING 207
160 161	EMPIRICAL	RESRCH GRP. 454
162 163	EPIC COM	P 510 P.CORP. 139 P.CORP. 435
164 165	EPSON AN	P.CORP. 435 IERICA 406, 407
166 167	ESSEX PUI	IERICA 406, 407 BLISHING 429 SCANCARD SYS. 371
168	EXPOTEK :	236
	The same of the sa	The second secon

Inquiry No. Page No. **EXXON OFFICE SYS.CO. 301** EXXON OFFICE SYS.CO. 301
FANTASTIC SIMULATIONS 512
FIBERFAB,INC. 454
FORETHOUGHT PRODUCTS 460
FOX & GELLER ASSOC. 514
FRANKLIN MINT CORP. 192, 193
FREDERICK COMP. PROD. 250
FREE COUPONS 467
FREEDOM TECHN.INT'L. 445
FROG PRINCE,THE 516
FRYE ELECTR. 439
FYI INC. 345 FRYE ELECTR. 439
FYI INC. 345
G & G ENGINEERING 133
G-H COMPUTER SYS. 506
GENERAL ELECTRIC CO. 171
GENERAL SOFTWARE INC. 526
GENSTAR REI SALES CO. 109
GENSTAR REI SALES CO. 508
GILTRONIX,INC. 510
GILTRONIX,INC. 510
GILTRONIX,INC. 510
GREAT PLAINS SOFTWARE 95
H&E COMPUTRONICS 233
HAYES MICROCOMP.PROD. 19
HAYES MICROCOMP.PROD. 19
HAYES MICROCOMP.PROD. 19 178 HAE COMPUTRONICS 393
HAYES MICROCOMP.PROD. 191
HAYES MICROCOMP.PROD. 295
HAYES MICROCOMP.PROD. 316
HEATH COMPANY 129
HERTZ CORP.THE 235
HEWLETT-PACKARD 143
HIGH TECH.SFTW.PROD. 183
HILTON HOTEL CORP. 77 HILTON HOTEL CORP. 77 HOWE SOFTWARE 514 HYPERTEK, INC 298 ILB.C. 57
I.Q.SYSTEMS 101
IMS INTERNATIONAL 297
INDIGO TECHNOLOGY 302
INFOSOFT COMP.SYS. 522
INTULINST.OF APPLD.TECH 306
INT'L.MICRO SYS. 309
INTEGRAL DATA SYS. 281
INTEGRAL DATA SYS. 281
INTEGRAL DATA SYS. 281
INTERACTIVE MICROWRE. 262
INTERACTIVE MICROWRE. 262
INTERACTIVE MICROWRE. 262
INTERACTIVE MICROWRE. 262
INTERACTIVE STRUCTURES 292
INTERACTIVE MICROWRE. 262
INTERACTIVE STRUCTURES 292
INTERACTIVE MICROWRE. 273
IPS INT'L. 508
ISE 126, 127
ISE 303
ISE 126, 127
ISE 303
ISOTECH,INC. 120
ITHACA INTERSYSTEMS 8
ITHACA INTERSYSTEMS 8
ITHACA INTERSYSTEMS 9
J.C.SYSTEMS 466
JADE COMP.PROD. 527
JADE COMP.PROD. 528, 529
JAMECO ELECTR. 540, 541
JDR MICRODEVICES 534, 535
JIMSCOT,INC. 431
KADAK PRODUCTS 349
KEELE CODES LTD. 443
KERN PUBLISHING 18
KERN PUBLISHING 19
KIT 80 INC. 504
KIT 80 INC. 504
KIT 80 INC. 504
KIT 80 INC. 504
KRAMER SYS INT'L. 433
LABORATORY MICROSYS. 506
LEADING EDGE PROD CINC. 431 I.B.C. 57 I.Q.SYSTEMS 101 201 203 204 207 208 209 217 218 227 228 229 232 KRAMER SYS INT'L. 433
LABORATORY MICROSYS. 506
LEADING EDGE PROD CIII
LEHIGH VALLEY LOGIC INC. 431
LEO ELECTRONICS 422
LIFEBOAT ASSOC. 141
LIFEBOAT ASSOC. 181
LJK ENTERPRISES INC. 331
LNW RESEARCH 279
LOGICAL DEVICES 508
LOMAS DATA PRODUCTS 197
LYBEN COMP.SYS. 504
LYBEN COMP.SYS. 504
LYBEN COMP.SYS. 512
MACROTECH INT'L. 313
MACROTECH INT'L. 31 241 244 242 

To get further information on the products advertising in BYTE, fill out the reader service card with your name and address. Then circle the appropriate numbers for the advertisers you select from the list. Add an 18-cent stamp to the card, then drop it in the mail. Not only do you gain information, but our advertisers are encouraged to use the marketplace provided by BYTE. This helps us bring you a big. ger BYTE. The index is provided as an additional service by the publisher, who assumes no liability for errors or omissions. \*Correspond directly with company

Inquiry No. Page No. MBP SFTF.&SYS.TECH. 283 MCGRAW-HILL BOOK CO. 367 MCGRAW-HILL RESEARCH 271 MCMILLAN BOOK CLUBS 449 MEDIA DISTRIBUTING 416 MEMORY MERCHANT 231
MEMOTECH 163
METAMORPHIC SYS.INC. 247
METAVAN INC. 516
MICRO AGE COMP.STORE 41
MICRO BUSINESS WORLD 343
MICRO BUSN.ASSOC 510
MICROCOM 173
MICRO DEVELOPMENTS 248
MICRO FOCUS 165
MICRO MAGAZINE 402
MICRO MAGAZINE 402
MICRO MANAGEMENT SYS. 307
MICRO MINT 182 MEMORY MERCHANT 231 265 MICRO MANAGEMENT SYS. 301
MICRO MINT 182
MICRO MINT 522
MICRO PRINTER MRKTG 149
MICRO PRO INT'L. 339
MICRO WORKS, THE 441
MICRO-SPOT ELECTR. 504
MICRO-SPOT ELECTR. 504
MICRO-SPOT SYNAMICS 508
MICRO-STAN SYNAMICS 508
MICRO-MICRO-SPOT ELECTR. 504
MICRODYNAMICS 508
MICROHOUSE 222, 223
MICROMAIL 254
MICROSETTE INC. 512
MICROSOFT (CPD) 87
MICROSOFT (CPD) 305
MICROSTUF, INC. 209
MICROTECH EXPORTS 427
MIKOS 346
MILLER MICROCOMP.SERV. 434
MILWAUKEE COMP.INC. 363
MINI COMP.SUPPLIERS 427
MINI MICRO MART 317
MOORE BUSN. FORMS 474
MORROW DESIGNS 168, 169
MOUNTAIN VIEW PRESS 357
MPI 379
MTI, INC. 440
MULTI BUSN.COMP.INC. 428
MULTITECH ELECTR.INC. 99
NAT'L.GRAPHICS OF CO. 422
NESS 268
NEC HOME ELECTR. USA 43 278 279 283 294 295 297 298 NEBS 268
NEC HOME ELECTR.USA 43
NEC INFORMATION SYS. 361
NEC INFORMATION SYS. 361
NEECO 397
NET PROFIT COMP. 432
NETRONICS 450, 451
NETWORK CONSULTING CORP 130
NEW GENERATION SYS. 455
NORPAK LIMITED 241
NORTH STAR COMPUTERS 442
NOVATION 403
NRI SCHOOLS ELECTR.DIV. 353
OASIS SYSTEMS 174
OLYMPIC SALES 445
OMEGA SALES 415
OPTIMAL TECHNOLOGY 418
ORANGE MICRO 261
ORYX SOFTWARE 212
ORYX SOFTWARE 212
ORYX SOFTWARE 217
ORSDORNE/MCGRAW-HILL 269
OSBORNE/MCGRAW-HILL 26 327 334 458

RADIO SHACK CIV RANA SYSTEMS 122, 123 RCA AMERICOM 468

Inqu	iry No.	Page No.
292		STATE 97
360 312	RCE 429	N COMP.PROD. 184, 185
361		LCOTT ENG. 433
363		VOLUTIONARY
000	COMP. 264	
364		NCE TECHN, 220
365		L INT'L. 405
		EVE INC. 239
366		
454		H.INC. 304
367	S-100 INC	
368		MP. TECH. 27 YSTEMS INC. 520
369		C ENG. 508
370		
371	SCITRONIC	
372	SCOTIA SC	OFTWARE 208
		LE SYSTEMS 259
373	SCR ELEC	
374		COMP PRODS 327
375 376		CORP. 37
377		H FOR COMP. 157
378		MP.PROD. 435
379		TA SCIENCES 53

Inq	uiry No.	Page No.
380 381	SLUDER 51 SLUDER 52	Ó
382 383	SOFTWARE	IC. 365 AICROSYS 347 CONSLTG.SERV. 504 TE SALES 503
384 385 386 387	SONICS MI SORRENTO SOURCE TE	CRO SYS. 518 VALLEY ASSOC 232 LECOMP.CORP. 285 SFTW.CORP. 160
388 389 390	STATE OF A	ALABAMA 159 MORY SYS 381 N TWO 439
391 392 393	STRICTLY S	RY TREE COMP. 441 SOFTWARE 195 1 F AMERICA 421
394 395 396 397		CS 518
398 399 400	SYNCOM 1	LUTIONS 514
401	SYSTEMS C	ROUP, THE 29

	SYSTEMS GROUP, THE 29
	SYSTEMS PLUS INC. 131
	TAB BOOKS 401
	TARBELL ELECTR. 219
	TECHNICAL ENGINEERING 520
	TECMAR INC 175
409	TECMAR INC 251
	TEKTRONIX INC. 55
	TEKTRONIX INC. 258
	TEKTRONIX INC. 260
410	TELEVIDEO INC 104, 105
	TENLEY DESIGN 416
	TERMINALS TERRIFIC 56
	TERRAPIN INC. 369
	TEXAS COMP.SYS. 355
	TINNEY, RBT. GRAPHICS 400
	TRANSNET CORP. 443
	TRAXX COMP.CORP. 217
	TRISTAR DATA SYS. 278
463	TSA PROFORMA 520
	TSC 267
	U.S. MICRO SALES 538, 539
	U.S. ROBOTICS 437
	UNISOURCE ELECTR.INC 280
	UNIVERSAL INFO.SYS. 516
423	VANDATA 455

Page No.

Inquiry No.

Inqu	JITY NO.	Page No.
425 426	VERBATIM	RAPHICS 79
	VIDEX 21	
428	VISIBLE CO VISICORP	OMP.SUPPLY 463
429		MPUTER CO 93
430	VYNET CO	
431	WALKER,V	VILLIAM 518
		ROBINS AFB 308
433		ON COMP.SERV. 517
		THS LTD 269
	WICAT SYS	
434		PUBLISHING 404
		COMP.SYS. 399
436	WINCHEN	DON GRP,THE 522
438	WINTEK C	ORP. 506
439	WINTERHA	ALTER & ASSOC. 420
	WRITEWRI	
440		
441		
442		RP. 244, 245
443	ZOBEX 187	
*Con	rrespond a	lirectly with compan

#### National Advertising Sales Representatives:

Northeast (617) 444-3946 ME, NH, VT, MA, CT, RI, DE, MD, VA, WV, OK, TX, Upstate NY, Eastern Canada

Hajar Associates 280 Hillside Ave. Needham Heights, MA 02194

Mid Atlantic (201) 741-7744 NY, NYC, NJ, PA

Hajar Associates 321 Broad St. Red Bank, NJ 07701 Southeast (305) 628-3525 NC, SC, GA, FL, AL, MS, TN, KY

Hajar Associates Diplomat Bldg. 5400 Diplomat Circle Suite 272 Orlando, FL 32810

Midwest (312) 966-0160 MN, WI, MI, IA, IL, IN, OH, MO, NE, KS, ND, SD, AR

Hajar Associates 5225 Old Orchard Rd. Suite 50 Skokie, IL 60076

Northwest (415) 964-0706 AK, HI, WA, OR, ID, MT, WY, Northern California, Nevada Except Las Vegas, Western Canada

Hajar Associates 1000 Elwell Ct. Suite 124 Palo Alto, CA 94303

Southwest (714) 540-3554 UT, CO, AZ, NM, Las Vegas, Southern California

Hajar Associates 3303 Harbor Blvd. Suite H-4A Costa Mesa, CA 92626

#### **European Advertising Sales Representatives:**

Mr. Simon Smith McGraw-Hill Publishing Co. 34 Dover St. London W1X 3RA England 1-493-1451

Mr. Andrew Karnig Andrew Karnig & Associates Kungsholmsgatan 10 112 27 Stockholm, Sweden 08/51-68-70

Mr. Hans Csokor Publimedia Reisnerstrasse 61 A-1037 Vienna, Austria Mr. Fritz Krusebecker McGraw-Hill Publishing Co. Liebigstrasse 27C D-6000 Frankfurt/Main 1 West Germany 72-01-81

Mr. Michael Sales McGraw-Hill Publishing Co. 17 rue Georges Bizet F 75116 Paris France 720-33-42

Mr. A. Fabio Guarnieri McGraw-Hill Publishing Co. Via Bracchini 1 20123 Milan, Italy 88-90-617

Mrs. Gurit Gepner McGraw-Hill Publishing Co. 115 Yosephtal St. Bat Yam, Israel 866-561

**SAVE 6 INCHES, 10 POUNDS, AND \$800.** 



On the new, slicked-up, trimmed-down Starwriter F-10. ribbons.

It's C. Itoh's latest genera-tion of letter-quality printers.

It cranks out flawless copy at 40 cps; and its full 15" carriage lets it double in brass for both letter processing and business applications. You can plug it into almost any micro on the market (serial or parallel) simply by plugging it in. And then make it keep on trucking with inexpensive. easily available Diablo compatible daisy wheels and

In its serial mode, it can print just about anything including boldface, underlines, subscripts and superscripts), and snap the carriage back to start the next line in less than a second. In its line mode, it prints in both directions, for even faster throughput.

While making about as much noise as a cat walking on Kleenex.)

It's a nice, portable 30 pounds-about 10 pounds lighter than the Starwriters before it. And it stands

exactly as tall (or precisely as small) as a dollar bill. Speaking of which: Incredibly, the Starwriter F-10 sells for about the same preposterously low price as its predecessors. Which is to say, about \$800 less than a lot of other printers that don't even come close to measuring up. Or even better...

Measuring down.

Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021. Call: tollfree 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

Circle 234 on inquiry card.

Radio Shack's TRS-80° is Your Best Choice in a **First Computer** 

Why? Because you can start with our \$999 Model III and easily—and economically—expand into a powerful, professional system!

- Add Up to 4 Double-Density Disk Drives-2 Internally
- Go from 16K to 48K Memory
- Add RS-232-C Interface
- Or Get It All with Our \$2495 Model III Desktop Computer

A Radio Shack Model III is a versatile, self-contained computer that can grow with you. Whether you're a beginner or a pro, there's one that fits your budget and intended use. And features you'd expect to pay extra for are standard on Model III.

The built-in "extras". Our \$999 system includes: a 65-key keyboard with 12-key data pad, a 12" high-resolution monitor, and a parallel printer interface.

You get much more, including 16K memory, powerful Model III BASIC language, 500 and 1500 baud cassette operation, 16 lines of 64 or 32 upper and lower case characters. repeating keys, special graphics characters, program editor and real time clock.

Model III is ready for a wide range of professional and personal uses. Choose from our large library of user-proven programs or develop your own applications in easy-to-learn BASIC. Just add a cassette recorder to store and run programs \$999

Choose our professional Model III Desktop Computer for more sophisticated applications. You get the same basic features as the smaller model, but with 48K internal memory. two built-in double-density mini disk drives for 368K of program and data storage and a built-in RS-232 Serial Interface to communicate with other computers using an optional telephone coupler, like our new Modem II (right). Our powerful disk operating system (TRSDOS) is included along with an expanded Disk BASIC language. And we have optional programming languages to meet specific needs-choose from COBOL, Assembler, Compiler BASIC and FORTRAN. And of course the smallest Model III can be upgraded to this top of the Model III line. \$2495 Cat. No. 26-1066.

100H, ACRES 15, 1981

Get a "hands-on" demonstration of the TRS-80 Model III today at more than 240 Radio Shack Computer Centers and 6200 Radio Shack stores and participating dealers nationwide. Ask about our service and leasing plans, too.

The biggest name in little computers™

A DIVISION OF TANDY CORPORATION

**NEW! Direct-Connect** Modem II Automatically Dials and Answers Phone Connects Directly to Phone Line And Any RS-232-Equipped TRS-80 Now your TRS-80 can access and transfer data by telephone. Program the Modem II to dial and answer, receive and transmit, even hang-up. 300 baud. FCC registered.

\$249

COMPANY ADDRESS CITY

Send me a free TRS-80 catalog.

Dept. 82-A-130 1300 One Tandy Center Fort Worth, TX 76102

Mail To: Radio Shack

Cat. No. 26-1173.

Retail prices may vary at individual stores and dealers.